MAY 2 8 1993

RMT, Inc.
100 Verdae Blvd.
P.O. Box 16778
Greenville, SC 29606
Phone: 803-281-0030
FAX: 803-281-0288

RPM
C017

Medley Farm
6.8

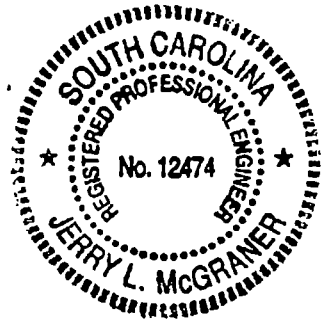
MEDLEY FARM SITE
GAFFNEY, SOUTH CAROLINA

REMEDIAL DESIGN AND REMEDIAL ACTION

PREFINAL/FINAL REMEDIAL DESIGN REPORT

May 1993

Prepared for the
Medley Farm Site Steering Committee



Mark A. Miesfeldt
Project Hydrogeologist

Jerry L. McGraner, P.E.
Project Engineer

Steve W. Webb, Ph.D., P.E.
Project Coordinator

David G. Nichols, P.G.
Project Manager

I:\WP\9\93811 MF/cdf93

10294278

Engineering and Environmental Management Services

PREFACE

A set of drawings has been developed to accompany this submittal. These drawings are referenced by title and number in the Table of Contents following this page.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

Section **Page**

List of Tables

List of Figures

TABLE OF CONTENTS (Continued)

Section **Page**

List of Plates

List of Appendices

List of Drawings

Section 1
PROJECT DESCRIPTION

1.1 Background

On May 29, 1991, the United States Environmental Protection Agency (US EPA) issued its Record of Decision (ROD) for the Medley Farm Site. This document set forth the Agency's rationale and selected remedy for addressing affected ground water and soils identified at the site. The US EPA's Medley Farm ROD was based on the findings of the Remedial Investigation/Feasibility Study (RI/FS) conducted by the Settling Defendants for the Medley Farm Site's technical consultant, Sirrine Environmental Consultants, Inc. On October 9, 1991, the Settling Defendants for the Medley Farm Site (hereinafter referred to as the Medley Farm Site Steering Committee) formally entered into a Consent Decree outlining the basis for Remedial Design and Remedial Action at the site. The Consent Decree was formally entered with the United States District Court on January 17, 1992. The members of the Medley Farm Site Steering Committee have jointly agreed to implement the remedy defined by the ROD, the Consent Decree and Statement of Work (SOW), which is a part of the Consent Decree. The ROD and SOW comprise the primary technical resource documents that have been used during the design of the remedy described herein.

RMT, Inc. (RMT) was retained by the Medley Farm Site Steering Committee to develop and implement the ROD-selected remedy. As a part of the required project deliverables, RMT prepared and submitted a Remedial Design Work Plan to the US EPA and the South Carolina Department of Health and Environmental Control (SC DHEC) for review and approval. This document described the general approach and schedule for completion of the Remedial Design portion of the RD/RA. The US EPA formally approved RMT's RD Work Plan for the Medley Farm Site on August 24, 1992.

The Preliminary Remedial Design (PRD) was submitted for US EPA review and comment on November 19, 1992. Agency approval of this document occurred on December 23, 1992.

This Prefinal Remedial Design Submittal is the second major project deliverable (with the PRD report being the first) called for under the approved RD project schedule. The Medley Farm SOW outlines specific US EPA technical requirements concerning the content of this document. This Prefinal

Remedial Design Report has been prepared in accordance with the requirements of the Medley Farm ROD, Consent Decree, SOW and RD Work Plan.

1.2 Purpose and Scope

The purpose of this document is to present RMT's process design basis, plans, specifications, construction schedule, and cost estimates for soil and ground water remediation systems to be constructed and operated at the Medley Farm Site. It is also the intent of this document to report the findings of supplemental data acquisition activities, outline general permitting strategies, and communicate RMT's approach and intentions for the remainder of the RD/RA process.

The Prefinal Remedial Design Report is a major project deliverable and milestone called for in the RD Schedule, Consent Decree, and SOW. This report provides the US EPA and SC DHEC with an opportunity to review and comment upon the design plans and specifications for the Medley Farm Site prior to the issuance of the Final Design Report.

This document establishes the technical basis for the detailed design considerations and contains the process flow diagrams, process narratives, general arrangement drawings, sections, details, engineering drawing, specifications, cost estimates, and construction schedules for Agency review and consideration. Following approval of this document by the US EPA, RMT will finalize work upon the next significant project milestone for the RD/RA, the Final Design Report.

1.3 Regulatory Requirements

1.3.1 RD/RA Consent Decree

Section VI.11.f (Page 17) of the Medley Farm Consent Decree (Appendix A) requires that the Prefinal/Final Design Report include, at a minimum, the following: (1) final plans and specifications; (2) a final construction schedule; (3) operation and maintenance plan; (4) field sampling plan (directed at measuring progress towards meeting Performance Standards); and (5) contingency plan. The contingency plan called for in the Consent Decree is actually scheduled for preparation and submission as a part of the Remedial Action Planning process (see SOW, p. 19–Task III.A.). The field sampling plan (Performance Standards Verification Plan) and the operations and maintenance plan are being prepared as separate documents to be utilized in conjunction with this design report.

NEED TO FORMALLY OK THIS.

1.3.2 Scope of Work

Task II.C. (Pages 18–19) of the Scope of Work (Appendix B), entitled Prefinal/Final Design, requires that the Prefinal/Final design include the following:

- Address comments generated by US EPA/SC DHEC from Preliminary Design Review;
- Certification of all final design documents by a Professional Engineer registered in the State of South Carolina;
- Complete design analyses;
- Complete plans and specifications;
- Final construction schedule; and
- Construction cost estimate.

This document has been prepared to address these requirements.

1.4 SC DHEC Construction Permit Application

In accordance with SC DHEC requirements, RMT has included an Application for Permit to Construct a Wastewater Treatment or Collection System. The permit application, itself, is presented in Appendix C. The design materials which form this report constitute the required supporting documentation and details for this permit application.

1.5 Draft SC DHEC NPDES Permit

On May 13, 1993, SC DHEC issued draft NPDES Permit No. SC0046469 to the Medley Farm Site Steering Committee for review and comment. This draft permit is presented in its entirety in Appendix D. When finalized, this permit will outline the specific requirements and conditions under which treated ground water will be permitted to discharge to Jones Creek.

Section 2
RESULTS OF DATA ACQUISITION ACTIVITIES

2.1 Supplemental Ground Water Characterization

In accordance with the Medley Farm ROD, Consent Decree and SOW, supplemental field activities were conducted at the Medley Farm Site to further characterize ground water quality. These supplemental field activities included the following tasks:

TASK 1. Water quality testing of the site ground water to determine if additional treatment of the ground water is needed to address possible concerns for corrosion, scaling, precipitant formation, or other possible engineering contingencies associated with ground water treatment.

TASK 2. Additional evaluations and/or analytical testing of the ground water and surface water to identify possible inorganic constituents that may affect NPDES permitting considerations.

TASK 3. Further assessment of the extent (vertical and horizontal) of the ground water contaminant plume in the northeast direction, as described by the Medley Farm FSAP.

In addition, three ground water recovery wells (A-1, A-4, and B-4) were installed as part of these supplemental field studies. Pumping tests were conducted in two of these wells (A-4 and B-4). The objective of these pumping tests was to determine site aquifer constants for input into the ground water flow model that has been used to develop the remedial design presented herein. Well A-1 was used to obtain additional site water quality data.

Ground water and surface water samples collected to address the needs raised in Tasks 1 and 2 were obtained during the fourth quarter of 1992 and the first quarter of 1993. These data were used to finalize preliminary design considerations prior to submission of this Prefinal Design Report.

2.1.1 Inorganic Analyses for Ground Water Treatment Design

To determine if additional treatment of the ground water was needed to address possible concerns for corrosion, scaling, precipitant formation, or other related engineering contingencies, supplemental ground water samples were collected from monitoring wells SW-4 and SW-108. These ground water samples were analyzed for the indicator parameters and inorganic constituents listed on Table 2-1. The analytical results from Table 2-1 were then

TABLE 2-1

SUMMARY OF INORGANIC ANALYSES FOR GROUND WATER TREATMENT ENGINEERING DESIGN - DECEMBER 1992

PARAMETERS	MONITORING WELL SW04	MONITORING WELL SW108
Alkalinity as $CaCO_3$	40	60
Alkalinity, bicarbonate as $CaCO_3$	40	60
Alkalinity, carbonate as $CaCO_3$	<20	<20
COD	<5.0	21
Carbon dioxide	60	65
Chloride	8.2	5.1
Hardness as $CaCO_3$	26	71
Hydrogen sulfide as reactive	<1.0	<1.0 H(1)
Nitrogen, ammonia	<0.10	<0.10
Solids, total dissolved	88 H(26)	270
Solids, total suspended	230	71
Sulfate	<10	60
Total organic carbon as NPOC	0.30	5.5
Aluminum, total	1.8	7.5
Arsenic, total	<0.003	<0.003
Barium, total	0.15	0.24
Cadmium, total	<0.0003	0.0017
Calcium, total	5.7	13.0
Chromium, total	0.27	0.0061
Copper, total	<0.020	<0.020
Iron, total	4.7	12.0
Lead, total	0.003	0.017
Manganese, total	0.25	2.2
Mercury, total	<0.0002	<0.0002
Nickel, total	0.15	<0.040
Selenium, total	<0.003	<0.003
Silver, total	0.0026	<0.001
Zinc, total	0.08	0.25

mg/kg

a Analytical results are reported in parts per million.
Hn Analysis performed "n" days past holding time.
< Less than the contract required quantitation limit.
NPOC Non Purgeable Organic Carbon

used to evaluate the scaling and corrosion potential of the ground water using the Langelier Saturation Index (LSI) and the Aggressive Index (AI), as described by Singley, *et al*, 1985.

The LSI (where LSI = pH - $pH_{SAT.}$) was calculated to be -2.77 at the wellhead where the temperature of the ground water is 60°F. An LSI less than zero is interpreted to mean that the ground water is undersaturated with respect to $CaCO_3$ and will tend to dissolve solid $CaCO_3$. To test the sensitivity for temperature, the calculation was rerun using an assumed wellhead temperature of 80°F. The result of this calculation was -2.56, again indicating that the ground water will not tend to scale.

To evaluate corrosive affects, the AI was calculated (where AI = pH + log $[Alkalinity_{Total}][Hardness_{Total}]$. The product of this calculation was found to be 9.25. An aggressive index of less than 10 indicates that the ground water is corrosive, which is not uncommon for this area of the state. Moderately aggressive waters fall in the range of 10–12, and non-aggressive waters have an AI>12. This information has been used to address material selection in the design basis.

The observed iron and manganese concentrations in the ground waters were examined to identify the potential for precipitant formation after air stripping. Oxidation of iron and manganese frequently results in the presence of oxides that can adversely affect treatment systems. The observed levels of iron and manganese were not deemed to be a problem at this site.

2.1.2 Inorganic Analyses for NPDES Permitting

To identify possible inorganic constituents that could affect NPDES permitting considerations, ground water samples were also collected from recovery wells A-4 and B-4 and from two locations in Jones Creek. The samples were analyzed for the constituents listed in Table 2-2. Analytical results from samples collected in Jones Creek show the presence of aluminum, calcium, iron, and manganese. Analytical results from recovery wells A-4 and B-4 show the presence of calcium, iron, magnesium, manganese, potassium, and sodium. Assuming that the water quality results from wells A-4 and B-4 are representative of the site ground water, which we believe to be the case, those observed levels of inorganic constituents should present no

TABLE 2-2

SUMMARY OF INORGANIC ANALYSES FOR NPDES PERMITTING DECEMBER 1992

PARAMETERS	JONES CREEK SAMPLING PT JC01	JONES CREEK SAMPLING PT JC02	RECOVERY WELL A04	RECOVERY WELL B04
Aluminum, total	0.38	0.11	<0.10	<0.10
Antimony	NA	NA	<0.010	<0.010
Arsenic, total	<0.003	<0.003	<0.003	<0.003
Barium, total	<0.050	<0.050	<0.050	<0.050
Beryllium	NA	NA	<0.005	<0.005
Cadmium, total	<0.0003	<0.0003	<0.005	<0.005
Calcium, total	3.8	2.8	8.58	7.36
Chromium, total	<0.002	<0.002	<0.010	<0.010
Cobalt	NA	NA	<0.050	<0.050
Copper, total	<0.020	<0.020	<0.020	<0.020
Iron, total	3.7	0.55	<0.10	0.158
Lead, total	<0.003	<0.003	<0.003	<0.003
Magnesium	NA	NA	3.1 B	2.57 B
Manganese, total	0.29	0.037	0.070	0.0198
Mercury, total	<0.0002	<0.0002	<0.0002	<0.0002
Nickel, total	<0.040	<0.040	<0.040	<0.040
Potassium	NA	NA	1.21 B	1.99 B
Selenium, total	<0.003	<0.003	<0.003	<0.003
Silver, total	<0.001	<0.001	<0.010	<0.010
Sodium	NA	NA	11.2	10.5
Thallium	NA	NA	<0.003	<0.003
Vanadium	NA	NA	<0.050	<0.050
Zinc, total	<0.020	<0.020	<0.020	<0.020

a Analytical results are reported in parts per million.
B (inorganic) Less than the required detection limit but greater than the instrument Detection Limit.
< Less than the contract required quantitation limit.
NA Not analyzed.

problem from an NPDES permitting perspective. Indeed, this has proven to be the case as evidenced by the lack of inorganic parameters in the draft NPDES permit (Appendix D).

2.1.3 Ground Water Screening Survey

A ground water screening survey was performed to better delineate the horizontal extent of VOCs in the ground water north and east of well pair SW-108 and BW-108. Data presented in the Medley Farm RI Report suggested that the unnamed tributary to Jones Creek, which borders the site to the east, might be a ground water discharge area. A ground water screening survey was conducted to assess water quality conditions near the water table to determine the location of confirmation monitoring wells. *In-situ* ground water samples were collected from locations identified with a HC designation on Plate 1. Ground water samples were collected to the north and east of the unnamed tributary of Jones Creek until field VOC concentrations were observed to fall below their respective MCLs. *In-situ* ground water samples were collected using In-Situ Technology's "Direct Push Sampling Technology," further discussed in Section 5.6 of the Medley Farm FSAP. Ground water obtained using this system was screened in the field for volatile organic compounds using a portable gas chromatograph. Ground water screening results from this effort are summarized in Table 2-3.

2.1.4 Monitoring Well Installation and Sampling

As a result of the ground water screening survey, four ground water monitoring wells were installed on-site. Wells SW-201, BW-201, SW-202, and BW-202 were installed at locations shown on Plate 1. Monitoring wells SW-201 and SW-202 were installed to assess the horizontal extent of site constituents at the water table. Based on the results of the ground water screening survey, these wells were installed at the edge of or outside the area known to contain VOCs.

Since the ground water screening survey could not address water quality conditions in the transition zone and bedrock, monitoring wells BW-201 and BW-202 were installed to assess the extent of VOCs in these units. These wells were installed as well pairs adjacent to the shallow wells. Water quality information obtained from these new wells has been used to enhance the design of the ground water recovery system.

U . S . EPA REGION IV

SDMS

Unscannable Material Target Sheet

DocID: 4278 Site ID: SCD980558142

Site Name: Medley Farms BOX 6 of 13

Nature of Material:

Map:	✓	Computer Disks:	
Photos:		CD-ROM:	
Blueprints:		Oversized Report:	
Slides:		Log Book:	

Other (describe):

Amount of material: 1 (Data Point Location Map with Water Table Configuration - Feb. 1993)

Please contact the appropriate Records Center to view the material.

TABLE 2-3

SUMMARY OF GROUND WATER SCREENING RESULTS [a]

SAMPLE NO. SAMPLING DEPTH [c]	HC-1 [b] 32 Ft.	HC-2S [b] 15 Ft.	HC-2D [b] 30 Ft.	HC-3 [b] 18 Ft.
VOLATILE ORGANICS				
Toluene	0.003	0.004	ND	0.003
Tetrachloroethene	0.007	0.060	0.172	0.004
Trichloroethene	ND	0.065	0.160	ND
cis-1,2-Dichloroethene	ND	0.003	0.010	ND
Benzene	ND	ND	ND	ND
Ethyl Benzene	ND	ND	ND	ND
Xylenes	ND	ND	ND	ND
trans 1,2-Dichloroethene	ND	ND	ND	ND

a - In-situ ground water samples obtained using "direct-push" sampling technology developed by In Situ, Inc.
b - Analytical results are reported in parts per million.
Analysis performed using a portable gas chromatograph.
c - Depths measured in feet below land surface.
ND - Compound not detected.
NOTE: Because of the soil conditions at hydrocone sampling locations HC-4 and HC-5, no samples were collected.

Drilling and well installation was accomplished in accordance with the procedures outlined in Section 5.7 of the Medley Farm FSAP. The location and elevation of these newly installed wells has been determined by a land survey according to the procedures outlined in Section 3.4 of the Medley Farm FSAP.

Ground water samples were collected from the new wells during the third quarterly sampling event, conducted during September and October 1992. Samples were collected according to the procedures outlined in Section 5.5 of the FSAP. Water quality results from wells SW-201 and SW-202 support the results obtained from the screening survey. VOCs were not detected in well SW-201 across the creek. Tetrachloroethene was the only compound identified in well SW-202 above site clean-up levels. Analytical results from well BW-201, across the creek,

showed the presence of trichloroethene, and tetrachloroethene at concentrations above site clean-up levels. Results from well BW-202 identified 1,2-dichloroethane, trichloroethene, and tetrachloroethene above site clean-up levels.

These data suggest that the unnamed tributary to Jones Creek may serve as a boundary for VOCs migrating near the surface of the water table. However, this tributary does not appear to control VOC migration in the transition zone and bedrock.

2.2 Site Environmental Conditions

The discussion in Sections 2.2.1 through 2.2.3 is based on information contained in the Medley Farm RI/FS Report prepared by Sirrine Environmental Consultants, the US EPA's Record of Decision, and RMT's recent field work which includes the installation of three ground water recovery wells, two vapor extraction wells, six vapor monitoring well pairs, surface geologic mapping, and water quality information obtained from the quarterly ground water sampling program.

2.2.1 Site Geology

The Medley Farm site is located within the Kings Mountain Belt of the Piedmont physiographic province. The Kings Mountain belt is characterized by a metamorphosed and deformed sequence of interbedded volcanic and sedimentary rocks (metavolcanics and metasediments). In the vicinity of the site, rock units strike northeast and dip moderately to steeply to the southeast (Mittwede, 1989).

Residual soil at the site is either absent or occurs as a thin layer overlying the saprolite. The observed soil layer ranges in thickness up to 11 feet and typically consists of clayey silt with varying amounts of fine sand, clay, silt and silty clay fill. The fill was probably placed on-site during the US EPA 1983 emergency removal action. Fill material and residual soil are not significant in terms of overall site geology.

The saprolite across the site, ranges in thickness from 50 to 70 feet near the former disposal areas to 7 to 28 feet along Jones Creek at the eastern boundary of the property. The lithologic characteristics of the saprolite are similar to the residual soils and are relatively consistent both vertically and horizontally. Saprolite observed in borings drilled at the site consist

predominantly of a silt with varying amounts of fine to coarse sand, clay, mica flakes, and quartz gravel. The quartz gravel appears to occur as a later stage fracture fill. The saprolite grades downward into rock-type transitional between saprolite and bedrock. This interval is loosely defined by split-spoon refusal (i.e., greater than 150 blows to advance the split-spoon one foot). The thickness of the transition zone averages approximately 15 feet beneath the former disposal areas and increases to more than 60 feet along a northeast-southwest trending fault. RMT geologists have interpreted this feature as being present approximately 150 feet southeast of well BW-112. Southeast of the interpreted fault, the thickness of the transition zone averages about 15 feet.

The characteristics of the bedrock have been investigated by continuous coring and by field mapping of exposures observed in Jones Creek and its tributaries. Based on hand sample observations, two distinct geologic units have been identified on-site (Plate 2). One of the units, located northwest of the inferred fault, is composed primarily of lighter-colored rock types (felsic metavolcanics and meta sediments). The second unit, located to the southeast of the inferred fault, is composed primarily of darker-colored rock types (mafic metavolcanics and metasediments). The bedrock is predominantly hard, slightly weathered to fresh, gray, and fine to medium-grained, with closely to moderately-closely (0.5 to 2.5 feet) spaced joints. The joints tend to be smooth to rough and moderately dipping (35 to 55 degrees). Foliation of the bedrock is moderately dipping (35 to 55 degrees) to steep (55 to 85 degrees). Evidence of ground water movement through the bedrock was observed in the form of iron oxide staining along joint surfaces.

2

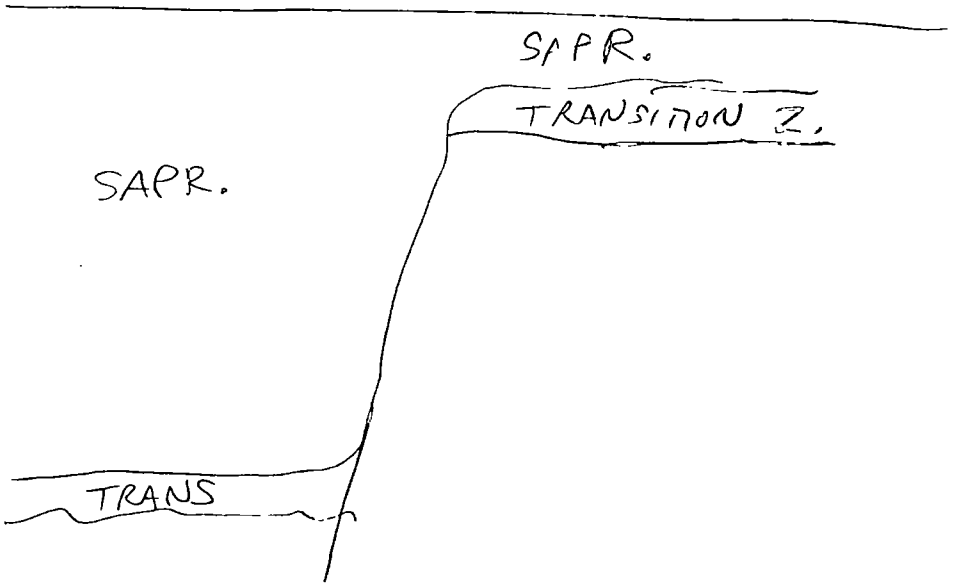
WHICH?

ARE THERE TWO DIFFERENT APPEARANCE? TO THE UNITS? SHOULD BE EVIDENT IN HAND SAMPLES... AND IN OUTCROP...

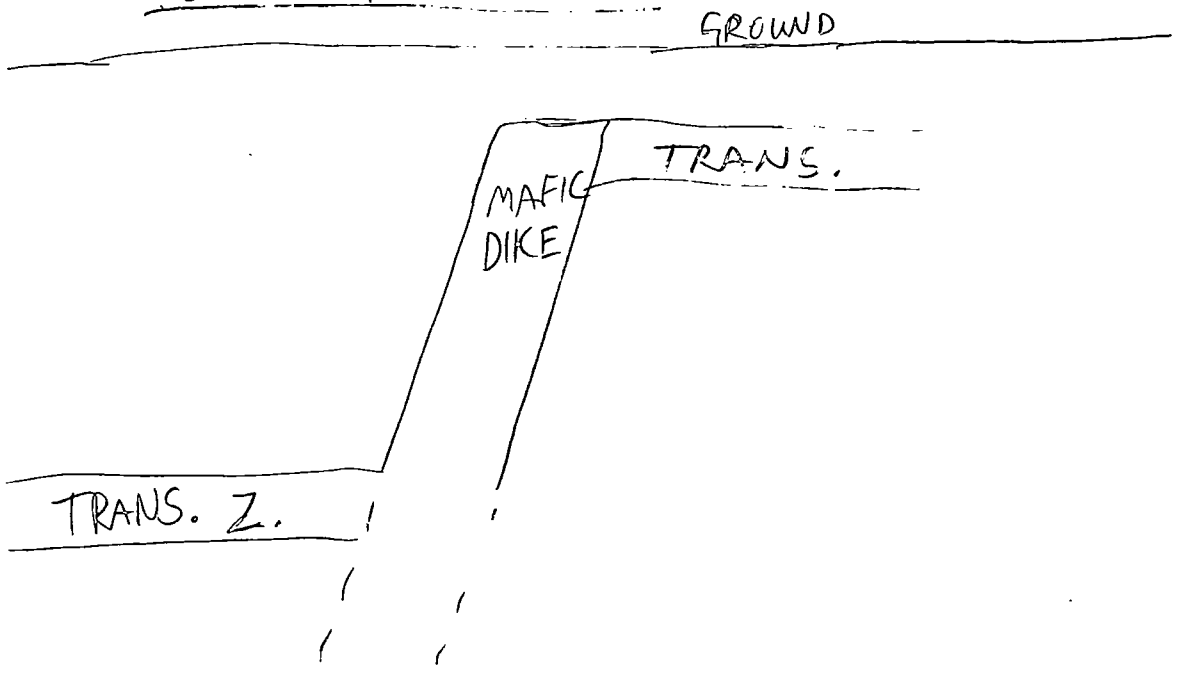
The configuration of the top of bedrock, as shown on Plate 3, approximates the shape of the topographic surface. A northeast-southwest trending fault has been interpreted to exist southeast of the former disposal area. Although the surface expression of this fault is not exposed, the existence of this structure is supported by subsurface data. Magnetic intensity data have been collected along four lines which cross the inferred fault trace. The location of these lines are shown on Plate 1. Figures 2-1, 2-2, and 2-3 are graphic presentations relating the site stratigraphy to the magnetic intensity data, along survey Lines 1, 2, and 3, respectively. Stratigraphic information is not available within the immediate vicinity of Line 4, but the magnetic intensity data for that line are presented in Figure 2-4. Magnetic intensities along

COULD BOTH UNITS BE OVER

RMI's Fault:



Possible Alternative:



U . S . EPA REGION IV

SDMS

Unscannable Material Target Sheet

DocID: 4278 Site ID: SCD980558142

Site Name: Medley Farms Box 16 of 13

Nature of Material:

Map:	✓	Computer Disks:	
Photos:		CD-ROM:	
Blueprints:		Oversized Report:	
Slides:		Log Book:	

Other (describe):

Amount of material: 21 Map of Surface Geology)(Configuration of TOP OF BEDROCK

Please contact the appropriate Records Center to view the material.

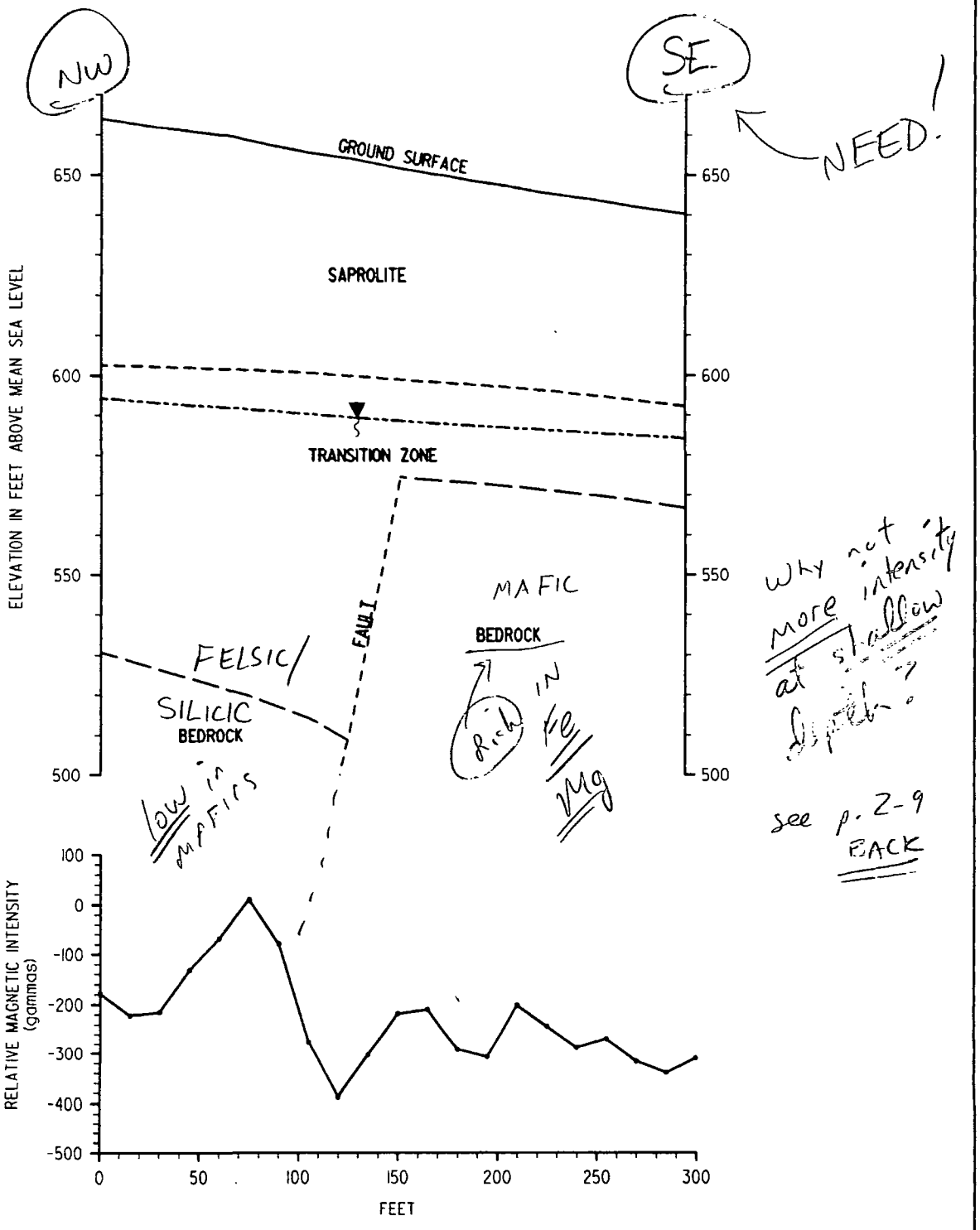


FIGURE 2-1

MAGNETIC INTENSITY AND STRATIGRAPHIC PROFILE LINE 1

RMT INC.

938.10
0593

MEDLEY FARMS
GAFFNEY, SC

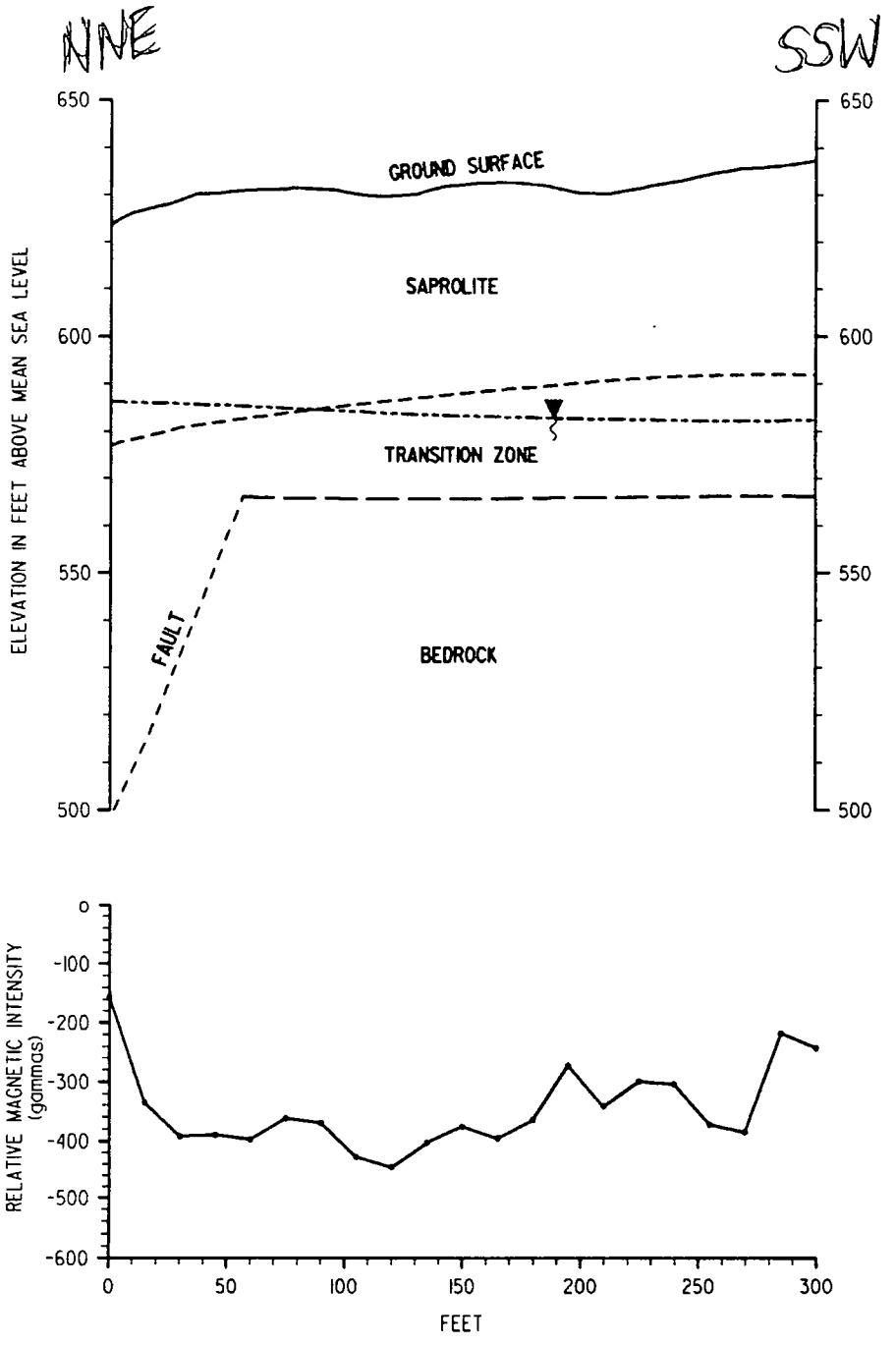


FIGURE 2-2

MAGNETIC INTENSITY AND STRATIGRAPHIC PROFILE LINE 2

938.10
0593

MEDLEY FARMS
GAFFNEY, SC

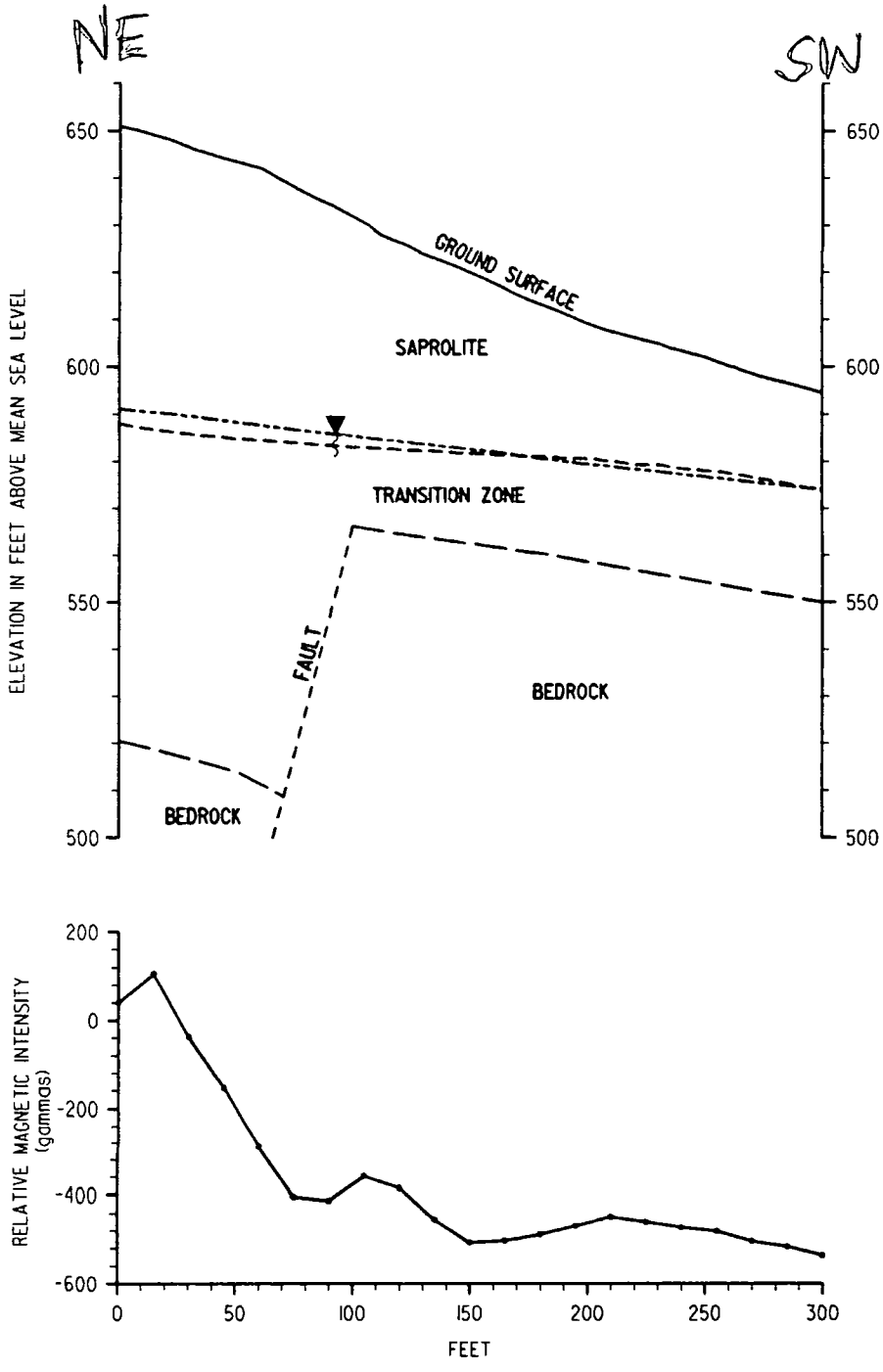


FIGURE 2-3

MAGNETIC INTENSITY AND STRATIGRAPHIC PROFILE LINE 3

938.10
0593

MEDLEY FARMS
GAFFNEY, SC

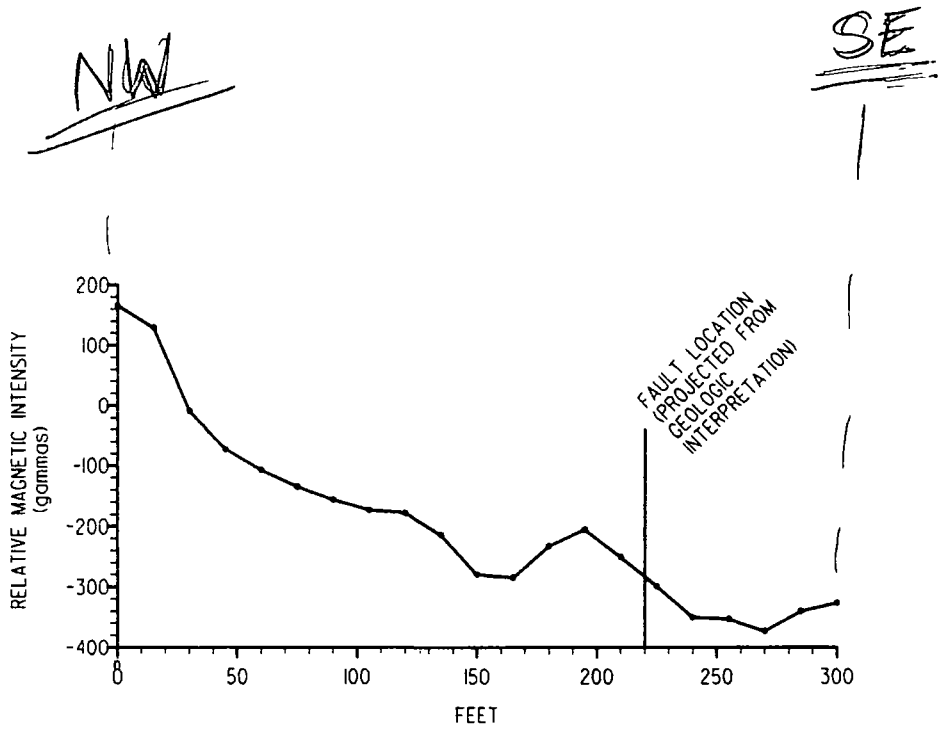


FIGURE 2-4

MAGNETIC INTENSITY
LINE 4

RMT INC.

938.10
0593

MEDLEY FARMS
GAFFNEY, SC

Lines 1, 2, and 3 decrease significantly from the northwest side of the inferred fault location to the southeast side of the inferred fault. Line 4 also shows a decrease in intensity to a location marking the extension of the inferred fault. Although the subsurface conditions responsible for the diminished magnetic responses on the more mafic side of the fault cannot be determined with currently available information, the magnetic intensity data are consistent with the existence of a structural dislocation. OK... but pos/neg reading on # gammas still makes no sense...

As shown on Plate 3, the elevation of the top of bedrock south of the fault is higher than the elevation of bedrock to the north. The location of the fault also closely corresponds to the contact between the felsic and mafic metamorphic sequences mapped in the tributaries of Jones Creek. In addition, the proposed trace of the fault roughly parallels the orientation of a steep, northwest-dipping, quartz-vein-filled fault mapped 400 feet to the northwest near the location of recovery well A-4. Assuming that this fault and the proposed larger structure are related, then a steep northwest dip is a reasonable interpretation for this structure. This fault appears to control the observed southeastern migration of VOCs in the ground water and account for the lack of observed VOC affects in the southwest portion of the site.

GIVE BASIS FOR ASSUMPTION... common? literature suggests?....

2.2.2 Site Hydrogeology

Ground water at the Medley Farm Site occurs in the saprolite, in the zone of highly fractured and weathered bedrock zone (identified as the transition zone), and in moderately fractured bedrock immediately underlying the transition zone. Depth to ground water at the site varies from 56 to 68 feet in the former disposal areas, decreasing to six to eight feet near Jones Creek.

In general, ground water flow occurs through both porous and fractured media at the Medley Farm Site. The water table generally occurs in the saprolite across most of the Medley Farm property, with the saprolite serving as a porous medium for ground water flow. In the vicinity of BW-2 and SW-109, located at the downgradient edge of the former disposal area and along the previously described fault, the surface of the water table appears to occur in the bedrock transition zone. The ground water occurring in the saprolite and bedrock is part of interconnected water bearing units. Ground water within the bedrock at the site is assumed to be present under unconfined conditions for modeling considerations.

Observed well yields from monitoring wells completed in the saprolite are generally low. Yields from bedrock wells are relatively higher, but depend on the nature, quantity, and interconnection of the secondary (fracture) porosity encountered. Bedrock wells completed in the moderately fractured bedrock and transition zone at the site exhibit moderate yields in the range of five to fifteen gallons per minute. Ground water flow from wells completed in the saprolite can be quite slow, as evidenced by the length of the time for water levels to recover following bail-down (several hours for complete recovery of many site wells).

Ground water flow at the Medley Farm Site occurs primarily to the southeast towards Jones Creek, as shown in Plate 1. The hydraulic gradient averages approximately 0.044 ft/ft across the site. The calculated horizontal ground water flow velocities are estimated to range from 400 feet/year to 475 feet/year for the saprolite.

Water level measurements collected in May 1992 from the eight saprolite/bedrock well clusters indicated both upward and downward vertical ground water gradients. Upward vertical gradients were observed at five well nests located adjacent to the unnamed tributaries to Jones Creek (BW-106/SW-106, SW-108/BW-108, SW-201/BW-201, SW-202/BW-202, and PZ-1/BW-3). These upward vertical ground water gradients indicate ground water discharge to these tributaries. Downward vertical gradients were observed at the remaining three locations (BW-1/SW-1, SW-4/BW-105, and BW-109/SW-109).

Jones Creek and its tributaries, to a lesser extent, appear to serve as zones of ground water discharge from the Medley Farm Site. Base flow in Jones Creek at the site is reported to be approximately 0.45 CFS (US EPA Record of Decision, 1991). During the RI field activities, water levels in the saprolite and bedrock adjacent to Jones Creek (PZ-1 and BW-3) were consistently above water levels measured during RI field activities observed in the tributary at staff gauge SL-3. The water level in BW-106 was greater than the water level observed in the tributary at staff gauge SL-5. However, the water level in SW-106 was less than the water level observed at staff gauge SL-5, indicating localized surface water recharge to the saprolite aquifer at this location.

2.2.3 Quarterly Ground Water Quality Results

The Medley Farm RI identified the presence of volatile organic compounds (VOCs) in the underlying saprolite and bedrock units. The RI further indicated the presence of VOCs and semi-volatile organic compounds (SVOCs) in the unsaturated zone soils of three small areas of the site, where several former lagoons were once located. The chemicals described in Table 2-4 have been identified as the primary Constituents of Concern (COCs) at the Medley Farm Site.

VOCs were detected in 12 of the site monitoring wells installed during the RI. In addition, VOCs have been detected in the four wells installed during the supplemental RI (SW/BW-201 and SW/BW-202), the three newly installed recovery wells (A-1, A-4, and B-4), and bedrock wells BW-111 and BW-112. These findings have been confirmed during the quarterly monitoring program implemented during the RD/RA. The extent of site-related chemicals in the surface soils is limited to the former disposal area. There are no indications of COCs in the stream sediments or surface water of the intermittent tributaries.

Ground water samples have been collected on a quarterly basis at the Medley Farm Site since 1992. In addition, ground water samples have been collected from the newly installed ground water recovery wells designated A-1, A-4, and B-4. Analytical results from 1992 are summarized in Tables 2-5 and 2-6, 2-7, and 2-8. Ground water quality exceedances of the ROD-based Site remediation levels are shown on Plate 4.

2.2.4 Subsurface Soil Results

No vertical pattern of chemical distribution in subsurface soils is apparent. Elevated concentrations of waste constituents were generally found at depths less than 17 feet. Elevated concentrations of VOCs were noted at depths of 27 feet in soil borings SB-2, SB-4, and SB-9. Subsurface soil sampling locations are shown on Plate 1. Analytical data for subsurface soils are summarized on Table 2-9. Soil vapor extraction will be conducted in three areas of the site identified by the ROD.

TABLE 2-4

CONSTITUENTS OF CONCERN (COCs) FOR MEDLEY FARM SITE BY MEDIUM

	Surface Soils	Ground Water (Saprolite)	Ground Water (Bedrock)
Volatile Organic Compounds			
1,1-Dichloroethene		X	X
1,1-Dichloroethane		X	
1,1,1-Trichloroethane		X	X
1,1,2-Trichloroethane	X	X	
1,1,2,2-Tetrachloroethane	X		
1,2-Dichloroethane			X
1,2-Dichloroethene(total)	X	X	X
1,2-Dichloropropane	X		
2-Butanone			X
Acetone			X
Benzene			X
Chloroform			X
Chloromethane		X	
Ethylbenzene	X		
Methylene Chloride	X	X	X
Styrene	X		
Tetrachloroethene	X	X	X
Trichloroethene	X	X	X
Vinyl Chloride	X		
Semi-Volatile Organic Compounds			
1,2,4-Trichlorobenzene	X		
Butylbenzylphthalate	X		
Di-n-butylphthalate	X		
Di-n-octylphthalate	X		
bis(2-Ethylhexyl)phthalate	X		

X Denotes Chemical Detected in Medium

TABLE 2-5

QUARTERLY SAMPLING DATA SUMMARY[a]
FEBRUARY 1992
MEDLEY FARM SITE

PARAMETERS	SW01	SW03	SW03 DL	SW04	SW101	SW106	SW108
	19-Feb-92	18-Feb-92	18-Feb-92	18-Feb-92	20-Feb-92	19-Feb-92	17-Feb-92
VOLATILE ORGANIC COMPOUNDS							
Acetone	0.004 BJ	0.006 BJ	<0.025	0.17 BJ	0.007 BJ	0.019 B	<0.010
Benzene	<0.010	<0.010	<0.025	<0.250	<0.010	<0.010	<0.010
2-Butanone	<0.010	<0.010	<0.025	<0.250	<0.010	<0.010	<0.010
Chloroform	<0.010	<0.010	<0.025	<0.250	<0.010	<0.010	0.003 J
1,1-Dichloroethane	<0.010	<0.010	<0.025	0.026 J	<0.010	0.001 J	0.005 J
1,2-Dichloroethane	<0.010	<0.010	<0.025	<0.250	<0.010	<0.010	0.002 J
1,1-Dichloroethene	<0.010	0.0008 J	<0.025	2.3	0.005 J	<0.010	0.016
1,2-Dichloroethene (total)	<0.010	0.003 J	0.002 DJ	0.019 J	<0.010	<0.010	0.006 J
4-Methyl-2-pentanone	<0.010	<0.010	<0.025	<0.250	<0.010	<0.010	<0.010
Tetrachloroethene	<0.010	0.30 E	0.30 D	<0.250	<0.010	<0.010	0.038
Toluene	<0.010	<0.010	<0.025	<0.250	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	<0.010	<0.010	<0.025	2.4	0.002 J	<0.010	0.008 J
1,1,2-Trichloroethane	<0.010	<0.010	<0.025	<0.250	<0.010	<0.010	<0.010
Trichloroethene	<0.010	0.18	0.18 D	0.011 J	0.0005 J	<0.010	0.057
SEMIVOLATILE ORGANIC COMPOUNDS							
bis(2-Ethylhexyl)phthalate		<0.010		<0.010			

a Analytical results are reported in parts per million.
B Analyte present in field blank.
D Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
NOTE: Shading denotes an exceedance of potential ground water remediation.

DL Sample diluted before analysis.
E Elevated detection limit due to matrix effects.
J Estimated concentration.

TABLE 2-5 (Continued)

QUARTERLY SAMPLING DATA SUMMARY [a]
FEBRUARY 1992
MEDLEY FARM SITE

PARAMETER	BW01	BW02	DU02	DU02 DL	BW04	BW105	BW106	BW108	BW108 DL
	19-Feb-92	20-Feb-92	20-Feb-92	20-Feb-92	20-Feb-92	18-Feb-92	19-Feb-92	17-Feb-92	17-Feb-92
VOLATILE ORGANIC COMPOUNDS									
Acetone	0.005 BJ	0.030 BJ	0.005 BJ	<0.050	0.004 BJ	<0.010	0.005 BJ	0.020 BJ	0.020 BDJ
Benzene	<0.010	<0.050	<0.010	<0.050	<0.010	<0.010	<0.010	0.001 J	0.001 DJ
2-Butanone	<0.010	<0.050	<0.010	<0.050	<0.010	<0.010	<0.010	<0.025	<0.050
Chloroform	<0.010	0.011 J	0.010	0.012 DJ	<0.010	<0.010	<0.010	0.027	0.031 DJ
1,1-Dichloroethane	<0.010	<0.050	<0.010	<0.050	<0.010	<0.010	<0.010	0.004 J	0.005 DJ
1,2-Dichloroethane	<0.010	0.52	0.50 E	0.55 D	<0.010	<0.010	<0.010	0.015 J	0.017 DJ
1,1-Dichloroethene	<0.010	0.30	0.30 E	0.30 D	<0.010	0.005 J	<0.010	0.19	0.19 D
1,2-Dichloroethene (total)	<0.010	0.003 J	0.003 J	0.003 DJ	<0.010	<0.010	<0.010	0.027	0.028 DJ
4-Methyl-2-pentanone	<0.010	<0.050	<0.010	<0.050	<0.010	0.003 J	<0.010	<0.025	<0.050
Tetrachloroethene	<0.010	0.020 J	0.018	0.020 DJ	<0.010	<0.010	<0.010	0.40	0.48 D
Toluene	<0.010	<0.050	<0.010	<0.050	<0.010	<0.010	<0.010	<0.025	<0.050
1,1,1-Trichloroethane	<0.010	0.17	0.15	0.16 D	<0.010	0.012	0.0006 J	0.11	0.12 D
1,1,2-Trichloroethane	<0.010	<0.050	0.002 J	<0.050	<0.010	<0.010	<0.010	0.001 J	<0.050
Trichloroethene	<0.010	0.63	0.52 E	0.66 D	<0.010	<0.010	<0.010	0.68 E	0.81 D
SEMIVOLATILE ORGANIC COMPOUNDS									
bis(2-Ethylhexyl)phthalate		0.009 J	<0.010			0.006 J			

a Analytical results are reported in parts per million.
B Analyte present in field blank.
D Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
NOTE: Shading denotes an exceedance of potential ground water remediation.

DL Sample diluted before analysis.
E Elevated detection limit due to matrix effects.
J Estimated concentration.

TABLE 2-5 (Continued)

QUARTERLY SAMPLING DATA SUMMARY [a]
FEBRUARY 1992
MEDLEY FARM SITE

PARAMETERS	RW05	RW06	DU01	FBLK01	RBLK01	TBLK01	TBLK02
	19-Feb-92	20-Feb-92	20-Feb-92	18-Feb-92	19-Feb-92	17-Feb-92	11-Feb-92
VOLATILE ORGANIC COMPOUNDS							
Acetone	0.009 BJ	0.007 BJ	<0.012	0.006 BJ	0.024 B	0.005 BJ	0.005 BJ
Benzene	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
2-Butanone	<0.010	<0.010	0.003 J	<0.010	<0.010	<0.010	<0.010
Chloroform	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethane	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethene	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethene (total)	0.0008 J	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
Tetrachloroethene	0.003 J	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	<0.010	0.010 J	<0.010	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	0.0007 J	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
1,1,2-Trichloroethane	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
Trichloroethene	0.005 J	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010
SEMIVOLATILE ORGANIC COMPOUNDS							
bis(2-Ethylhexyl)phthalate							

a Analytical results are reported in parts per million.
B Analyte present in field blank.
D Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
NOTE: Shading denotes an exceedance of potential ground water remediation.

DL Sample diluted before analysis.
E Elevated detection limit due to matrix effects.
J Estimated concentration.

TABLE 2-6

QUARTERLY SAMPLING DATA SUMMARY
JUNE 1992
MEDLEY FARM SITE

PARAMETERS [a]	BW01	BW02	BW04	BW105	BW106	BW108	BW108 DL	DU03 (BW108)	SW01	SW03
VOLATILE ORGANIC COMPOUNDS										
Benzene	<0.010	<0.062	<0.010	<0.010	<0.010	<0.010	<0.062	0.002 J	<0.010	<0.010
Chloroform	<0.010	<0.062	<0.010	<0.010	<0.010	<0.007 BJ	<0.062	0.009 J	<0.010	<0.010
1,1-Dichloroethane	<0.010	<0.062	<0.010	<0.010	<0.010	0.004 J	0.004 DJ	0.005 J	<0.010	<0.010
1,2-Dichloroethane	<0.010	0.65	<0.010	<0.010	<0.010	0.014	0.019 DJ	0.015 J	<0.010	<0.010
1,1-Dichloroethene	<0.010	0.40	<0.010	0.006 J	<0.010	0.079	0.11 D	0.088	<0.010	<0.010
1,2-Dichloroethene (total)	<0.010	<0.062	0.003 J	<0.010	<0.010	0.026	0.037 DJ	0.031 J	<0.010	0.004 J
Tetrachloroethene	<0.010	0.026 J	<0.010	<0.010	<0.010	0.47 E	0.56 D	0.49	<0.010	0.38 E
1,1,1-Trichloroethane	<0.010	0.20	<0.010	0.013	<0.010	0.051	0.061 DJ	0.052 J	<0.010	0.0007 J
Trichloroethene	<0.010	0.82	0.001 J	<0.010	<0.010	0.78 E	0.92 D	0.78	<0.010	0.26 E

a - Analytical results are reported in parts per million.
B - Analyte present in analytical method blank.
D,DL - Sample diluted before analysis.
E - Concentration exceeded calibration range of instrument.
J - Estimated concentration.
NOTE: Shading denotes an exceedance of potential ground water remediation levels.

TABLE 2-6 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
JUNE 1992
MEDLEY FARM SITE

PARAMETERS [a]	SW03DL	SW04	SW101	SW106	SW108	FBLK02	RBLK02	TBLK03	TBLK04
VOLATILE ORGANIC COMPOUNDS									
Benzene	<0.025	<0.12	<0.010	<0.010	0.0005 J	<0.010	<0.010	<0.010	<0.010
Chloroform	<0.025	<0.12	<0.010	<0.010	0.004 BJ	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	<0.025	0.024 J	<0.010	0.001 J	0.004 J	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethane	<0.025	<0.12	<0.010	<0.010	0.002 J	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethene	<0.025	1.5	0.005 J	0.002 J	0.021	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethene (total)	<0.025	0.018 J	0.003 J	<0.010	0.006 J	<0.010	<0.010	<0.010	<0.010
Tetrachloroethene	0.44 D	<0.12	<0.010	<0.010	0.048	<0.010	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	<0.025	2.5	0.002 J	<0.010	0.013	<0.010	<0.010	<0.010	<0.010
Trichloroethene	0.31 D	0.008 J	<0.010	0.001 J	0.077	<0.010	<0.010	<0.010	<0.010

a - Analytical results are reported in parts per million.
B - Analyte present in analytical method blank.
D,DL - Sample diluted before analysis.
E - Concentration exceeded calibration range of instrument.
J - Estimated concentration.
NOTE: Shading denotes an exceedance of potential ground water remediation levels.

TABLE 2-7

QUARTERLY SAMPLING DATA SUMMARY
SEPTEMBER 1992
MEDLEY FARM SITE

PARAMETER [a]	BW01	BW02	BW02DL	BW103	BW104	BW105	BW106
VOLATILE ORGANIC COMPOUNDS							
Acetone	<0.010	<0.002 Ju	<0.100	<0.010	<0.010 u	<0.003 Ju	<0.010
Benzene	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
Bromodichloromethane	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
2-Butanone	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
Chlorobenzene	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
Chloroform	<0.010	0.015	0.016 DJ	<0.010	<0.010	<0.010	<0.010
Dibromochloromethane	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethane	<0.010	0.930 E	0.950 D	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethene	<0.010	0.460 E	0.430 D	0.001 J	<0.010	0.004 J	<0.010
1,2-Dichloroethene (total)	<0.010	0.004 J	<0.100	<0.010	<0.010	<0.010	<0.010
1,2-Dichloropropane	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
cis-1,3-Dichloropropene	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
trans-1,3-Dichloropropene	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
2-Hexanone	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	<0.010	<0.001 Ju	<0.100	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
Tetrachloroethene	<0.010	0.030	0.028 DJ	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	<0.010	0.240 E	0.230 D	<0.010	<0.010	0.010 J	<0.010
1,1,2-Trichloroethane	<0.010	0.003 J	<0.100	<0.010	<0.010	<0.010	<0.010
Trichloroethene	<0.010	1.000 E	1.100 D	<0.010	<0.010	<0.010	<0.010

[a] - Analytical results are reported in parts per million.
[b] - Total trihalomethanes under Promulgated MCLs.
B - Analyte present in field blank.
[c] - Promulgated MCLs.
D - Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
DL - Sample diluted before analysis.
E - Elevated detection limit die to matrix effects.
J - Estimated concentration.

TABLE 2-7 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
SEPTEMBER 1992
MEDLEY FARM SITE

PARAMETER [a]	BW108	BW108DL	BW109	BW110	BW111	BW112	BW112DL
VOLATILE ORGANIC COMPOUNDS							
Acetone	<0.007 Ju	<0.050	<0.010	<0.006 Ju	<0.049 u	<0.026 u	<0.100
Benzene	0.001 J	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
Bromodichloromethane	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
2-Butanone	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
Chlorobenzene	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
Chloroform	0.012	0.012 DJ	<0.010	<0.010	<0.010	0.053	0.053 DJ
Dibromochloromethane	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
1,1-Dichloroethane	0.006 J	0.006 DJ	<0.010	<0.010	<0.010	0.006 J	<0.100
1,2-Dichloroethane	0.016	0.017 DJ	<0.010	<0.010	<0.010	0.170	0.170 D
1,1-Dichloroethene	0.110	0.100 D	<0.010	0.006 J	0.007 J	1.300 E	1.100 D
1,2-Dichloroethene (total)	0.037	0.039 DJ	<0.010	<0.010	<0.010	0.005 J	<0.100
1,2-Dichloropropane	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
cis-1,3-Dichloropropene	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
trans-1,3-Dichloropropene	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
Ethylbenzene	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
2-Hexanone	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
Methylene Chloride	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
4-Methyl-2-pentanone	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.100
Tetrachloroethene	0.560 E	0.540 D	0.004 J	<0.010	<0.010	0.038	0.037 DJ
Toluene	<0.010	<0.050	<0.010	<0.010	0.003 J	<0.010	<0.100
1,1,1-Trichloroethane	0.070	0.071 D	<0.010	0.003 J	0.008 J	0.740 E	0.640 D
1,1,2-Trichloroethane	0.001 J	<0.050	<0.010	<0.010	<0.010	0.003 J	<0.100
Trichloroethene	0.830 E	0.810 D	<0.010	<0.010	0.002 J	0.210 E	0.210 D

[a] - Analytical results are reported in parts per million.
[b] - Total trihalomethanes under Promulgated MCLs.
B - Analyte present in field blank.
[c] - Promulgated MCLs.
D - Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
DL - Sample diluted before analysis.
E - Elevated detection limit die to matrix effects.
J - Estimated concentration.

TABLE 2-7 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
SEPTEMBER 1992
MEDLEY FARM SITE

PARAMETER [a]	BW113	BW201	BW202	PW01	SW01	SW03	SW03DL
VOLATILE ORGANIC COMPOUNDS							
Acetone	<0.010	0.045	0.016	<0.010	<0.010	<0.010	<0.040
Benzene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
Bromodichloromethane	<0.010	<0.010	<0.010	0.006 J	<0.010	<0.010	<0.040
2-Butanone	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
Chlorobenzene	<0.010	<0.010	0.001 J	<0.010	<0.010	<0.010	<0.040
Chloroform	<0.010	0.001 J	0.001 J	0.032	<0.010	<0.010	<0.040
Dibromochloromethane	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
1,1-Dichloroethane	<0.010	<0.010	0.003 J	<0.010	<0.010	<0.010	<0.040
1,2-Dichloroethane	<0.010	0.001 J	0.027	<0.010	<0.010	<0.010	<0.040
1,1-Dichloroethene	<0.010	0.026	0.006 J	<0.010	<0.010	0.002 J	<0.040
1,2-Dichloroethene (total)	<0.010	0.008 J	0.014	<0.010	<0.010	0.006 J	<0.040
1,2-Dichloropropane	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
cis-1,3-Dichloropropene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
trans-1,3-Dichloropropene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
Ethylbenzene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
2-Hexanone	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
Methylene Chloride	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
4-Methyl-2-pentanone	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
Tetrachloroethene	0.001 J	0.058	0.130	<0.010	<0.010	0.430 E	0.390 D
Toluene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
1,1,1-Trichloroethane	<0.010	0.015	0.004 J	<0.010	<0.010	0.001 J	<0.040
1,1,2-Trichloroethane	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.040
Trichloroethene	<0.010	0.071	0.062	<0.010	<0.010	0.290 E	0.310 D

[a] - Analytical results are reported in parts per million.
[b] - Total trihalomethanes under Promulgated MCLs.
B - Analyte present in field blank.
[c] - Promulgated MCLs.
D - Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
DL - Sample diluted before analysis.
E - Elevated detection limit die to matrix effects.
J - Estimated concentration.

TABLE 2-7 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
SEPTEMBER 1992
MEDLEY FARM SITE

PARAMETER [a]	SW04	SW04DL	SW101	SW102	SW103	SW104	SW106
VOLATILE ORGANIC COMPOUNDS							
Acetone	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Bromodichloromethane	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Chlorobenzene	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.005 J	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Dibromochloromethane	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.024	0.025 DJ	<0.010	<0.010	<0.010	<0.010	0.002 J
1,2-Dichloroethane	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethene	1.800 E	2.100 D	0.007 J	0.008 J	<0.010	<0.010	0.002 J
1,2-Dichloroethene (total)	0.022	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
1,2-Dichloropropane	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
cis-1,3-Dichloropropene	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
trans-1,3-Dichloropropene	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
2-Hexanone	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Tetrachloroethene	0.003 J	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	2.700 E	2.300 D	0.002 J	0.002 J	<0.010	<0.010	<0.010
1,1,2-Trichloroethane	0.018	0.021 DJ	<0.010	<0.010	<0.010	<0.010	<0.010
Trichloroethene	0.014	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010

[a] - Analytical results are reported in parts per million.
[b] - Total trihalomethanes under Promulgated MCLs.
B - Analyte present in field blank.
[c] - Promulgated MCLs.
D - Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
DL - Sample diluted before analysis.
E - Elevated detection limit die to matrix effects.
J - Estimated concentration.

TABLE 2-7 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
SEPTEMBER 1992
MEDLEY FARM SITE

PARAMETER [a]	SW108	SW109	SW113	SW201	SW202	WM01	WM02
VOLATILE ORGANIC COMPOUNDS							
Acetone	<0.010	<0.010	<0.010	0.008 J	0.150	0.029	0.018
Benzene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
Bromodichloromethane	<0.010	<0.010	0.040	<0.010	<0.010	<0.010	<0.012
2-Butanone	<0.010	<0.010	<0.010	<0.010	<0.010	0.003 BJ	0.004 BJ
Chlorobenzene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
Chloroform	0.004 J	<0.010	<0.010	<0.010	0.004 J	<0.010	<0.012
Dibromochloromethane	<0.010	<0.010	0.040	<0.010	<0.010	<0.010	<0.012
1,1-Dichloroethane	0.002 J	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
1,2-Dichloroethane	0.002 J	<0.010	0.040	<0.010	0.002 J	<0.010	<0.012
1,1-Dichloroethene	0.026	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
1,2-Dichloroethene (total)	0.006 J	<0.010	0.028	<0.010	<0.010	<0.010	<0.012
1,2-Dichloropropane	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
cis-1,3-Dichloropropene	<0.010	<0.010	0.036	<0.010	<0.010	<0.010	<0.012
trans-1,3-Dichloropropene	<0.010	<0.010	0.034	<0.010	<0.010	<0.010	<0.012
Ethylbenzene	<0.010	<0.010	<0.010	<0.010	<0.010	0.001 J	<0.012
2-Hexanone	0.006 J	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
Methylene Chloride	<0.010	<0.010	0.028	<0.010	<0.010	<0.010	0.001 J
4-Methyl-2-pentanone	<0.010	<0.010	<0.010	<0.010	<0.010	0.002 J	<0.012
Tetrachloroethene	0.053	0.002 J	0.037	<0.010	0.016	<0.010	<0.012
Toluene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
1,1,1-Trichloroethane	0.014	<0.010	0.033	<0.010	<0.010	<0.010	<0.012
1,1,2-Trichloroethane	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.012
Trichloroethene	0.081	<0.010	<0.010	<0.010	0.004 J	<0.010	<0.012

[a] - Analytical results are reported in parts per million.
[b] - Total trihalomethanes under Promulgated MCLs.
B - Analyte present in field blank.
[c] - Promulgated MCLs.
D - Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
DL - Sample diluted before analysis.
E - Elevated detection limit die to matrix effects.
J - Estimated concentration.

TABLE 2-7 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
SEPTEMBER 1992
MEDLEY FARM SITE

PARAMETER [a]	WM03	WM04	FBLK01	TBLK02	TBLK04	TBLK05	TBLK10212
VOLATILE ORGANIC COMPOUNDS							
Acetone	0.028	0.020	0.014	0.047	0.046	0.042	0.007 J
Benzene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Bromodichloromethane	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	0.005 BJ	0.006 BJ	<0.010	<0.010	0.005 J	<0.010	<0.010
Chlorobenzene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Dibromochloromethane	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethane	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethene (total)	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
1,2-Dichloropropane	<0.011	<0.011	<0.010	<0.010	0.002 J	0.002 J	<0.010
cis-1,3-Dichloropropene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
trans-1,3-Dichloropropene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
2-Hexanone	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005 J	0.002 J	<0.010	<0.010	<0.010	<0.010	0.003 J
4-Methyl-2-pentanone	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Tetrachloroethene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Toluene	0.001 J	0.002 J	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,2-Trichloroethane	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Trichloroethene	<0.011	<0.011	<0.010	<0.010	<0.010	<0.010	<0.010

[a] - Analytical results are reported in parts per million.
[b] - Total trihalomethanes under Promulgated MCLs.
B - Analyte present in field blank.
[c] - Promulgated MCLs.
D - Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
DL - Sample diluted before analysis.
E - Elevated detection limit die to matrix effects.
J - Estimated concentration.

TABLE 2-7 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
SEPTEMBER 1992
MEDLEY FARM SITE

PARAMETER [a]	TBLK99354	TBLK99365	MCLs
VOLATILE ORGANIC COMPOUNDS			
Acetone	<0.010	<0.010	NA
Benzene	<0.010	<0.010	0.005
Bromodichloromethane	<0.010	<0.010	0.10 [b]
2-Butanone	<0.010	<0.010	NA
Chlorobenzene	<0.010	<0.010	0.1 [c]
Chloroform	<0.010	<0.010	0.1 [b]
Dibromochloromethane	<0.010	<0.010	0.10 [b]
1,1-Dichloroethane	<0.010	<0.010	NA
1,2-Dichloroethane	<0.010	<0.010	0.005
1,1-Dichloroethene	<0.010	<0.010	0.007
1,2-Dichloroethene (total)	<0.010	<0.010	0.07
1,2-Dichloropropane	<0.010	<0.010	0.005
cis-1,3-Dichloropropene	<0.010	<0.010	NA
trans-1,3-Dichloropropene	<0.010	<0.010	NA
Ethylbenzene	<0.010	<0.010	0.7
2-Hexanone	<0.010	<0.010	NA
Methylene Chloride	<0.010	<0.010	0.005 [c]
4-Methyl-2-pentanone	<0.010	<0.010	NA
Tetrachloroethene	<0.010	<0.010	0.005
Toluene	<0.010	<0.010	1.0
1,1,1-Trichloroethane	<0.010	<0.010	0.20
1,1,2-Trichloroethane	<0.010	<0.010	0.005
Trichloroethene	<0.010	<0.010	0.005

[a] - Analytical results are reported in parts per million.
[b] - Total trihalomethanes under Promulgated MCLs.
B - Analyte present in field blank.
[c] - Promulgated MCLs.
D - Dissolved analyte greater than total analyte. Analyses pass QC based on precision criteria.
DL - Sample diluted before analysis.
E - Elevated detection limit die to matrix effects.
J - Estimated concentration.

TABLE 2-8

QUARTERLY SAMPLING DATA SUMMARY
DECEMBER 1992
MEDLEY FARM SITE

PARAMETER[a]	BW01	BW02	BW02DL	BW04	BW105	BW106
VOLATILE ORGANICS						
Acetone	<0.010 BJu	<0.062 BJu	<0.10 BDJu	<0.010 BJu	<0.010 BJu	<0.010 BJu
Benzene	<0.010	<0.062	<0.10	<0.010	<0.010	<0.010
Chloroform	<0.010 Ju	<0.062 Ju	<0.10 DJu	<0.010	<0.010	<0.010
1,1-Dichloroethane	<0.010	0.002 J	<0.10	<0.010	<0.010	<0.010
1,2-Dichloroethane	<0.010	1.2	1.3 D	<0.010	<0.010	<0.010
1,1-Dichloroethene	<0.010	0.52	0.56 D	<0.010	0.005 J	<0.010
1,2-Dichloroethene (total)	<0.010	0.006 J	0.006 DJ	<0.010	<0.010	<0.010
1,2-Dichloropropane	<0.010	<0.062	<0.10	<0.010	<0.010	<0.010
Methylene chloride	<0.010	<0.062 BJu	<0.10 BDJu	<0.010	<0.010 BJu	<0.010 BJu
Styrene	<0.010	<0.062 BJu	<0.10 BDJu	<0.010	<0.010	<0.010
Tetrachloroethene	<0.010	0.031 J	0.032 DJ	<0.010	<0.010	<0.010
Toluene	<0.010	<0.062 BJu	<0.10 BDJu	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	<0.010	0.24	0.25 D	<0.010	0.011	<0.010
1,1,2-Trichloroethane	<0.010	0.003 J	0.003 DJ	<0.010	<0.010	<0.010
Trichloroethene	<0.010	1.4 E	1.5 D	<0.010	<0.010	<0.010
Xylenes (total)	<0.010	<0.062 BJu	<0.10 BDJu	<0.010	<0.010	<0.010

a - Analytical results are reported in parts per million.
B (Organics) - Analyte present in analytical method blank.
D, DL - Results from diluted sample.
E - Concentration exceeds instrument calibration range.
J - Estimated concentration.
u - Laboratory reported detection not validated during data validation process.
< (Organics) - Concentration less than the Contract Required Quantitation Limit.

TABLE 2-8 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
DECEMBER 1992
MEDLEY FARM SITE

PARAMETER[a]	BW108	BW108DL	BW201	BW202	FBLK02	RBLK02
VOLATILE ORGANICS						
Acetone	<0.025 BJu	<0.050 BDJu	<0.010 BJu	<0.010 BJu	0.079 B	0.078 B
Benzene	0.001 J	<0.050	<0.010	0.002 J	<0.010	<0.010
Chloroform	<0.025 Ju	<0.050 DJu	<0.010 Ju	<0.010 Ju	0.0006 J	0.0007 J
1,1-Dichloroethane	0.005 J	0.005 DJ	0.001 J	0.002 J	<0.010	<0.010
1,2-Dichloroethane	0.015 J	0.016 DJ	0.002 J	0.024	<0.010	<0.010
1,1-Dichloroethene	0.074	0.082 D	0.023	0.004 J	<0.010	<0.010
1,2-Dichloroethene (total)	0.028	0.029 DJ	0.007 J	0.009 J	<0.010	<0.010
1,2-Dichloropropane	<0.025	<0.050	<0.010	<0.010	0.0009 J	0.001 J
Methylene chloride	<0.025 BJu	<0.050 BDJu	<0.010 BJu	<0.010 BJu	0.0004 BJ	0.0004 BJ
Styrene	<0.025	<0.050 BDJu	<0.010	<0.010	<0.010	<0.010
Tetrachloroethene	0.44	0.44 D	0.067	0.12	<0.010	<0.010
Toluene	<0.025 BJu	<0.050 BDJu	<0.010	<0.010 BJu	<0.010	<0.010
1,1,1-Trichloroethane	0.044	0.043 DJ	0.013	0.003 J	<0.010	<0.010
1,1,2-Trichloroethane	0.0008 J	<0.050	<0.010	<0.010	<0.010	<0.010
Trichloroethene	0.71 E	0.72 D	0.088	0.046	<0.010	<0.010
Xylenes (total)	<0.025	<0.050 BDJu	<0.010	<0.010	<0.010	<0.010

a - Analytical results are reported in parts per million.
B (Organics) - Analyte present in analytical method blank.
D, DL - Results from diluted sample.
E - Concentration exceeds instrument calibration range.
J - Estimated concentration.
u - Laboratory reported detection not validated during data validation process.
< (Organics) - Concentration less than the Contract Required Quantitation Limit.

TABLE 2-8 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
DECEMBER 1992
MEDLEY FARM SITE

PARAMETER[a]	SW01	SW03	SW04	SW101	SW106	SW108
VOLATILE ORGANICS						
Acetone	<0.010 BJu	<0.025 BJu	<0.25 BJu	<0.010 BJu	<0.010 BJu	<0.010 BJu
Benzene	<0.010	<0.025	<0.25	<0.010	<0.010	<0.010
Chloroform	<0.010	<0.025 Ju	<0.25	<0.010	<0.010	<0.010 Ju
1,1-Dichloroethane	<0.010	<0.025	0.023 J	0.0002 J	0.001 J	0.002 J
1,2-Dichloroethane	<0.010	<0.025	<0.25	<0.010	<0.010	0.002 J
1,1-Dichloroethene	<0.010	0.002 J	2.8	0.005 J	0.002 J	0.020
1,2-Dichloroethene (total)	<0.010	0.004 J	0.018 J	<0.010	<0.010	0.004 J
1,2-Dichloropropane	<0.010	<0.025	<0.25	<0.010	<0.010	<0.010
Methylene chloride	<0.010 BJu	<0.025 BJu	<0.25 BJu	<0.010 BJu	<0.010 BJu	<0.010 BJu
Styrene	<0.010	<0.025	<0.25 BJu	<0.010	<0.010	<0.010
Tetrachloroethene	<0.010	0.49	<0.25	0.0003 J	<0.010	0.039
Toluene	<0.010	<0.025 BJu	<0.25 BJu	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	<0.010	0.001 J	2.8	0.002 J	<0.010	0.010
1,1,2-Trichloroethane	<0.010	<0.025	0.016 J	<0.010	<0.010	<0.010
Trichloroethene	<0.010	0.35	0.010 J	0.0005 J	0.0002 J	0.063
Xylenes (total)	<0.010	<0.025	<0.25 BJu	<0.010	<0.010	<0.010

a - Analytical results are reported in parts per million.
B (Organics) - Analyte present in analytical method blank.
D, DL - Results from diluted sample.
E - Concentration exceeds instrument calibration range.
J - Estimated concentration.
u - Laboratory reported detection not validated during data validation process.
< (Organics) - Concentration less than the Contract Required Quantitation Limit.

TABLE 2-8 (Continued)

QUARTERLY SAMPLING DATA SUMMARY
DECEMBER 1992
MEDLEY FARM SITE

PARAMETER[a]	SW202	TBLK01	TBLK02	TBLK03
VOLATILE ORGANICS				
Acetone	<0.010 BJu	0.002 BJ	0.004 BJ	0.008 BJ
Benzene	<0.010	<0.010	<0.010	<0.010
Chloroform	<0.010 Ju	0.0009 J	0.0007 J	0.0009 J
1,1-Dichloroethane	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethane	0.002 J	<0.010	<0.010	<0.010
1,1-Dichloroethene	<0.010	<0.010	<0.010	<0.010
1,2-Dichloroethene (total)	0.001 J	<0.010	<0.010	<0.010
1,2-Dichloropropane	<0.010	<0.010	0.0003 J	<0.010
Methylene chloride	<0.010 BJu	0.0003 BJ	0.0004 BJ	<0.010
Styrene	<0.010	<0.010	<0.010	<0.010
Tetrachloroethene	0.026	<0.010	<0.010	<0.010
Toluene	<0.010	<0.010	<0.010	<0.010
1,1,1-Trichloroethane	<0.010	<0.010	<0.010	<0.010
1,1,2-Trichloroethane	<0.010	<0.010	<0.010	<0.010
Trichloroethene	0.008 J	<0.010	<0.010	<0.010
Xylenes (total)	<0.010	<0.010	<0.010	<0.010

a - Analytical *results are reported in parts per million.*
B (Organics) - Analyte present in analytical method blank.
D, DL - Results from diluted sample.
E - Concentration exceeds instrument calibration range.
J - Estimated concentration.
u - Laboratory reported detection not validated during data validation process.
< (Organics) - Concentration less than the Contract Required Quantitation Limit.

TABLE 2-9

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN SUBSURFACE SOIL[a,b]
MEDLEY FARM SITE

COMPOUND[c]	SB-2				SB-3			
	DEPTH BELOW SURFACE (feet)				DEPTH BELOW SURFACE (feet)			
	5-7	10-12	15-17	25-27	5-7	10-12	15-17	25-27
VOLATILE ORGANIC COMPOUNDS								
1,1,2,2 Tetrachloroethane	NA	0.710	0.097	0.074	NA	ND	ND	ND
Chloroform	NA	0.600	ND	ND	NA	ND	ND	ND
1,2-Dichloroethane	NA	ND	ND	ND	NA	ND	ND	ND
Methylene Chloride	NA	ND	ND	ND	NA	0.050	ND	ND
Trichloroethene	NA	ND	ND	ND	NA	ND	ND	ND
Acetone	NA	18.0	7.3	0.750	NA	0.140	0.055	0.016
SEMIVOLATILE ORGANIC COMPOUNDS								
1,2-Dichlorobenzene	NA	ND	ND	ND	NA	ND	0.460	ND
Naphthalene	NA	ND	ND	ND	NA	ND	0.410	ND
Phenol	NA	77.0	ND	0.690	NA	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	NA	ND	2.300	ND
Diethylphthalate	NA	ND	ND	ND	NA	ND	ND	3.200
Benzoic Acid	NA	ND	ND	2.600	NA	ND	ND	ND
1,2,4-Trichlorobenzene	NA	ND	ND	5.200	NA	0.700	12.00	ND

a Analytical data taken from RI/FS prepared by Sirrine Environmental Consultants.
b Analytical results are reported in parts per million (PPM).
c Compounds detected in subsurface soil samples.
NA Sample not analyzed.
ND Compound not detected at or above the practical quantitation limit.
Note: Shaded blocks indicate concentrations above potential remediation level.

TABLE 2-9 (Continued)

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN SUBSURFACE SOIL[a,b]
MEDLEY FARM SITE

COMPOUND[c]	SB-4				SB-5			
	DEPTH BELOW SURFACE (feet)				DEPTH BELOW SURFACE (feet)			
	5-7	10-12	15-17	25-27	5-7	10-12	15-17	25-27
VOLATILE ORGANIC COMPOUNDS								
1,1,2,2 Tetrachloroethane	NA	ND	ND	ND	ND	ND	0.009	ND
Chloroform	NA	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	NA	3.700	4.500	0.680	ND	ND	ND	ND
Methylene Chloride	NA	0.010	0.032	0.017	ND	ND	ND	ND
Trichloroethene	NA	0.019	0.032	0.017	ND	ND	ND	ND
Acetone	NA	0.200	1.900	0.100	ND	0.021	0.570	ND
SEMIVOLATILE ORGANIC COMPOUNDS								
1,2-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND
Naphthalene	NA	ND	ND	ND	ND	ND	ND	ND
Phenol	NA	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	NA	ND	ND	ND	ND	ND	ND	ND
Benzoic Acid	NA	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND

a Analytical data taken from RI/FS prepared by Sirrine Environmental Consultants.
b Analytical results are reported in parts per million (PPM).
c Compounds detected in subsurface soil samples.
NA Sample not analyzed.
ND Compound not detected at or above the practical quantitation limit.
Note: *Shaded blocks indicate concentrations above potential remediation level.*

TABLE 2-9 (Continued)

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN SUBSURFACE SOIL[a,b]
MEDLEY FARM SITE

COMPOUND[c]	SB-6				SB-7			
	DEPTH BELOW SURFACE (feet)				DEPTH BELOW SURFACE (feet)			
	5-7	10-12	15-17	25-27	5-7	10-12	15-17	25-27
VOLATILE ORGANIC COMPOUNDS								
1,1,2,2 Tetrachloroethane	0.006	NA	ND	ND	ND	NA	ND	ND
Chloroform	0.013	NA	ND	ND	ND	NA	ND	ND
1,2-Dichloroethane	ND	NA	ND	ND	0.097	NA	ND	ND
Methylene Chloride	ND	NA	ND	ND	ND	NA	ND	ND
Trichloroethene	ND	NA	ND	ND	0.024	NA	ND	ND
Acetone	0.058	NA	ND	ND	4.700	NA	0.120	0.018
SEMIVOLATILE ORGANIC COMPOUNDS								
1,2-Dichlorobenzene	ND	NA	ND	ND	ND	NA	ND	ND
Naphthalene	ND	NA	ND	ND	ND	NA	ND	ND
Phenol	ND	NA	ND	ND	ND	NA	ND	ND
1,4-Dichlorobenzene	ND	NA	ND	ND	ND	NA	ND	ND
Diethylphthalate	ND	NA	ND	ND	ND	NA	ND	ND
Benzoic Acid	ND	NA	ND	ND	ND	NA	ND	ND
1,2,4-Trichlorobenzene	ND	NA	ND	ND	ND	NA	ND	ND

a Analytical data taken from RI/FS prepared by Sirrine Environmental Consultants.
b Analytical results are reported in parts per million (PPM).
c Compounds detected in subsurface soil samples.
NA Sample not analyzed.
ND Compound not detected at or above the practical quantitation limit.
Note: Shaded blocks indicate concentrations above potential remediation level.

TABLE 2-9 (Continued)

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN SUBSURFACE SOIL[a,b]
MEDLEY FARM SITE

COMPOUND[c]	SB-8				SB-9			
	DEPTH BELOW SURFACE (feet)				DEPTH BELOW SURFACE (feet)			
	5-7	10-12	15-17	25-27	5-7	10-12	15-17	25-27
VOLATILE ORGANIC COMPOUNDS								
1,1,2,2 Tetrachloroethane	ND	NA	ND	ND	NA	ND	ND	ND
Chloroform	ND	NA	ND	ND	NA	ND	ND	ND
1,2-Dichloroethane	ND	NA	ND	ND	NA	0.047	0.032	0.099
Methylene Chloride	ND	NA	ND	ND	NA	ND	ND	ND
Trichloroethene	ND	NA	ND	ND	NA	ND	ND	ND
Acetone	0.086	NA	0.058	0.250	NA	0.094	0.110	ND
SEMIVOLATILE ORGANIC COMPOUNDS								
1,2-Dichlorobenzene	ND	NA	ND	ND	NA	ND	ND	ND
Naphthalene	ND	NA	ND	ND	NA	ND	ND	ND
Phenol	ND	NA	ND	ND	NA	ND	ND	ND
1,4-Dichlorobenzene	ND	NA	ND	ND	NA	ND	ND	ND
Diethylphthalate	ND	NA	ND	ND	NA	ND	ND	ND
Benzoic Acid	ND	NA	ND	ND	NA	ND	ND	ND
1,2,4-Trichlorobenzene	ND	NA	ND	ND	NA	ND	ND	ND

a Analytical data taken from RI/FS prepared by Sirrine Environmental Consultants.
b Analytical results are reported in parts per million (PPM).
c Compounds detected in subsurface soil samples.
NA Sample not analyzed.
ND Compound not detected at or above the practical quantitation limit.
Note: Shaded blocks indicate concentrations above potential remediation level.

TABLE 2-9 (Continued)

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN SUBSURFACE SOIL[a,b]
MEDLEY FARM SITE

COMPOUND[c]	SB-10			
	DEPTH BELOW SURFACE (feet)			
	5-7	10-12	15-17	25-27
VOLATILE ORGANIC COMPOUNDS				
1,1,2,2 Tetrachloroethane	ND	NA	ND	ND
Chloroform	ND	NA	ND	ND
1,2-Dichloroethane	0.023	NA	ND	ND
Methylene Chloride	ND	NA	ND	ND
Trichloroethene	ND	NA	ND	ND
Acetone	0.031	0.004	0.040	0.065
SEMIVOLATILE ORGANIC COMPOUNDS				
1,2-Dichlorobenzene	ND	NA	ND	ND
Naphthalene	ND	NA	ND	ND
Phenol	ND	NA	ND	ND
1,4-Dichlorobenzene	ND	NA	ND	ND
Diethylphthalate	ND	NA	ND	ND
Benzoic Acid	ND	NA	ND	ND
1,2,4-Trichlorobenzene	ND	NA	ND	ND

a Analytical data taken from RI/FS prepared by Sirrine Environmental Consultants.
b Analytical results are reported in parts per million (PPM).
c Compounds detected in subsurface soil samples.
NA Sample not analyzed.
ND Compound not detected at or above the practical quantitation limit.
Note: Shaded blocks indicate concentrations above potential remediation level.

U . S . EPA REGION IV

SDMS

Unscannable Material Target Sheet

DocID: 4278 Site ID: SCD980558142

Site Name: Medley Farms Box 6 of 13

Nature of Material:

Map:	✓	Computer Disks:	
Photos:		CD-ROM:	
Blueprints:		Oversized Report:	
Slides:		Log Book:	

Other (describe):

Amount of material: 11 Distribution of VOCs Exceeding Potential Ground Water Remediation Levels

Please contact the appropriate Records Center to view the material.

2.3 Ground Water Modeling and Capture Zone Analysis

Given the chemistry and distribution of VOCs observed in the site ground water, a series of ground water recovery wells and associated treatment systems is needed to effect remediation of the site. More information regarding this is provided in Section 3. Since ground water flow from the observed source areas is influenced by the site geology, efficient interception of the ground water plume will require a bifurcated system of downgradient recovery wells. A preliminary ground water capture zone analysis was performed in order to assess the merits of this system and of three recovery wells. Ground water pump tests were performed on two ground water recovery wells (A-4 and B-4) to develop estimates of aquifer characteristics at the site for input into a ground water flow model.

The ground water flow model MODFLOW was used to simulate aquifer conditions at the site. Aquifer characteristics were defined based on interpretation of the aquifer tests (in conjunction with hydraulic conductivity results previously reported), knowledge of the site geology, and hydraulic head values measured across the site. Calibration of the MODFLOW model provided a more refined estimate of the distribution of hydraulic parameters across the site, and allowed for a more detailed evaluation of potential extraction well placements than the preliminary capture analysis completed during the preliminary design phase.

Modeling of the capture zones was based on GPTRAC in conjunction with hydraulic head output from MODFLOW. GPTRAC is a general particle tracking module of the Wellhead Protection Area (WHPA) computer program series, and provides for pathline and time-related definition of capture in situations involving well interference. Critical aquifer characteristics for GPTRAC were defined across the site based on calibrated output from MODFLOW. Pumping wells considered in the simulation were positioned downgradient of the monitoring wells known to contain COCs, at locations approximate to the edge of the plume (Plates 4 and 5). Pumping rates and pumping well placements were based on rates observed during the pumping tests and hydraulic conductivity values derived from the test analysis. Extraction well locations were adjusted to minimize the number of wells required for capture of plume constituents.

The most variable of the required input parameters was hydraulic conductivity (k). Hydraulic conductivities and lithologies opposite the screened portion of each monitoring well on which slug tests have been conducted and analyzed are summarized in Table 2-10. Wells screened in the saprolite and

TABLE 2-10

SINGLE WELL HYDRAULIC CONDUCTIVITIES AND ASSOCIATED LITHOLOGIES

Well Lithology	Slug Test Conductivity (cm/sec)	Pressure Test Conductivity (cm/sec)	Intake Lithology
SW-1	3.8×10^{-5}	--------	Saprolite
SW-3	7.8×10^{-4}	--------	Saprolite+Transition
SW-4	1.6×10^{-4}	--------	Transition
SW-102	1.6×10^{-3}	--------	Saprolite+Transition
SW-103	1.1×10^{-4}	--------	Saprolite+Transition
SW-104	7.8×10^{-4}	--------	Transition
SW-106	8.5×10^{-4}	--------	Saprolite
SW-108	3.1×10^{-5}	--------	Saprolite
SW-109	3.0×10^{-3}	--------	Saprolite+Transition
BW-1	3.8×10^{-3}	--------	Shallow Bedrock
BW-2	2.3×10^{-3}	2.6×10^{-4}	Transition
BW-3	1.9×10^{-3}	2.8×10^{-4}	Shallow Bedrock
BW-4	1.9×10^{-4}	1.7×10^{-4}	Transition
BW-106	--------	4.1×10^{-4}	Shallow Bedrock
BW-108	--------	4.4×10^{-5}	Shallow Bedrock
BW-109	--------	2.5×10^{-4}	Transition
BW-110	--------	2.6×10^{-4}	Shallow Bedrock
BW-111	--------	1.7×10^{-7}	Deep Bedrock
BW-112	--------	3.1×10^{-7}	Deep Bedrock

Hydraulic conductivities from "Final Remedial Investigation Report, Medley Farm Site, Gaffney, S.C.," Sirrine Environmental Consultants, February 1991.

SW wells are screened.

BW wells are open hole.

transitional zones exhibited slug test conductivities in the range 10^{-5} to 10^{-3} cm/sec. Slug and pressure test responses in the open hole bedrock wells indicated values between 10^{-7} and 10^{-3} cm/sec. Three wells, BW-2, BW-3 and BW-4, were tested by both the slug and water pressure methods. The lower pressure test values are accepted in preference to the slug test numbers, since the former reflect conductivities in a larger volume surrounding the test interval. Well BW-1 was not pressure tested, therefore, the validity of the high slug test value associated with it may be questionable.

GW- IS THIS OK? Yes.

Aquifer flow and capture characteristics are critically dependent on the transmissivity of the unit, which is defined as the aquifer thickness multiplied by the aquifer hydraulic conductivity. Therefore, pumping tests were conducted on recovery wells A-4 and B-4 to develop estimates of aquifer hydraulic conductivity, thickness, transmissivity, and storativity based on long-term hydraulic stress of the aquifer. Results of the aquifer test interpretations are summarized in Table 2-11. Hydraulic conductivity values derived from the pumping tests are approximately an order of magnitude greater than the hydraulic conductivity values derived from the slug tests. Such a difference in results is not uncommon, given that the two methods test the aquifer in different ways. Slug tests, by nature of the way the tests are conducted, affect only that portion of the aquifer in the immediate vicinity of the well being tested. Pumping tests, however, affect a larger area of the aquifer and produce results which are considered more representative of overall aquifer conditions than test results derived from slug tests. Therefore, aquifer test results served as the primary input values for the MODFLOW modeling.

Capture zones were modeled for a variety of well configurations. Input parameters were iteratively adjusted to minimize the number of pumping wells required for efficient containment of the observed Medley Farm ground water plume, incorporate existing extraction wells, and provide for flexibility in long-term operation of the system. Final input values are detailed in Table 2-12. Final well placements and various time-dependent zones of ground water capture are illustrated on Plate 5. Calculations assumed that there are no boundaries to flow. The 11 pumping wells ultimately required were theoretically pumped at different rates ranging from 2 gpm at well A-1 to 15 gpm at wells A-5 and A-6. The selected pumping rate at each well represents the maximum rate possible, given the average transmissivity and thickness at the specific well location. As illustrated on Plate 5, areas of effective capture grow most quickly in an upgradient direction. Lateral development tends to be an inverse function of the distance between neighboring wells. Capture zone coalescence leads to virtually complete interception of downgradient COC migration, within a period of three years. Ground water

TABLE 2-11

SUMMARY OF AQUIFER TEST RESULTS

WELL	OBSERVATION WELL	HYDRAULIC CONDUCTIVITY (cm/sec)	STORAGE COEFFICIENT (dimensionless)
Pumping Well A-4	BW-108	3.2×10^{-3}	0.0099
	BW-201	4.6×10^{-3}	NA
	SW-202	2.2×10^{-3}	0.016
Pumping Well B-4	SW-109	4.6×10^{-4}	0.0012
	BW-109	1.8×10^{-4}	0.0007
	SW-4	3.4×10^{-3}	0.045

NA - Calculation cannot be completed from graphed data.

TABLE 2-12

RANGES OF INPUT VALUES FOR GROUND WATER MODELING AND CAPTURE ZONE ANALYSES

Parameter	Input Value
Flow Direction	180 degrees
Flow Gradient	0.044-0.05 ft/ft
Effective Porosity	0.25
Aquifer Thickness	20 to 75 feet
Aquifer Hydraulic Conductivity	0.76 ft/day
Average Transmissivity	38.0 ft^2/day
Type of Aquifer	Unconfined
Number of Pumping Wells	12
Step Length	5 feet
Flow Boundaries	No boundaries
Areal Recharge Rate	8 inches per year
Pumping Rate	2 gpm to 15 gpm
Well Diameters	6 inch
Pumping Times Modeled	0.5, 1, 3, and 5 years

U . S . EPA REGION IV

SDMS

Unscannable Material Target Sheet

DocID: 4278 Site ID: SCD980558142

Site Name: Medley Farms Box 6 of 13

Nature of Material:

Map:	✓	Computer Disks:	
Photos:		CD-ROM:	
Blueprints:		Oversized Report:	
Slides:		Log Book:	

Other (describe):

Amount of material: 1 (THEORETICAL CAPTURE ZONES)

Please contact the appropriate Records Center to view the material.

within the entire area thought to contain remediation level exceedances is theoretically captured within a five-year time frame.

BELOW

2.4 Property Survey

During the design of the Medley Farm remedy, a boundary survey of the Medley Farm property will be conducted to locate and retrace property boundaries. This survey will identify easements, rights-of-way, and boundary infringements that may exist. This work will be conducted by a land surveyor registered by the State of South Carolina. The surveyor will prepare a plat for the site in conformance with the Minimum Standards for Land Surveying in South Carolina. Information from this survey will be incorporated into the design drawings.

I thought this had already been done - -
HOPE NOT SERIOUS...

Sec. 2-3 doesn't detail RMT's work as part of the pump tests, where they showed ability to induce upward flow out of bedrock... why? They need this ...
↖ see p. 3-2 (back of 3-1)

Section 3
PREFINAL DESIGN

3.1 Site-Specific Geologic and Hydrologic Influences on Design Basis

The supplemental field sampling and analytical activities conducted at the Medley Farm Site were performed to further investigate and confirm the nature and extent of VOC constituents present within the soils and ground water of the Medley Farm Site. The discussion which follows provides RMT's interpretation of what affect these site-specific geologic and hydrologic influences have on the remedial design.

3.1.1 Boundary Flow Conditions

To further investigate if the unnamed tributary to Jones Creek acts as a no flow boundary, an *in-situ* screening survey was conducted and monitoring well pair SW-201 and BW-201 and ground water recovery well A-4 were installed. A pumping test was conducted at well A-4 in accordance with RMT's Technical Memorandum dated February 12, 1993. The water quality data obtained from these new wells combined with the data generated during the pumping test on A-4 indicate that the unnamed tributary to Jones Creek is a boundary to VOCs migrating through the saprolite in the upper water table, but the unnamed tributary does not control VOC migration in the transition zone and bedrock.

3.1.2 Effect of Subsurface Geology on VOC Transport

Based on information presented in the Medley Farm RI report, an examination of available core samples and field reconnaissance mapping, a northeast-southwest trending fault has been interpreted to exist southeast of the former disposal areas. Historical water quality results, supplemented by analytical data from recovery wells A-1 and B-4, suggests that this geologic feature is controlling the southeastern migration of VOCs in ground water. In addition, field mapping has shown that foliation strikes to the northeast. Since the VOC plume is elongated in a northeastern direction, the rock foliation may also be controlling VOC migration on-site.

YES - OR SOME-THING IS...

RMT installed three recovery wells (A-1, A-4, and B-4) during the remedial design to collect additional site data. Recovery wells B-4 and A-1 were intentionally located in the vicinity of the inferred fault to obtain additional geologic information, water quality data, and ground water flow

?

Somewhere in Sec. 3.1.2,

NEED TO ACKNOWLEDGE POSSIBILITY THAT FAULT ↑ (COULD) HAVE A VERTICAL OR 70°-DIPPING ZONE (BAND) OR HIGHLY-PERMEABLE FAULT BRECCIA (LARGELY QUARTZ, PROBABLY).

? BASIS FOR LATER PROBS?

↖ see p. 2-45 comment

data as these wells were installed. By conducting pumping tests on Well B-4 and examining the stratigraphic and water quality information from wells A-1 and B-4, RMT has surmised that well B-4 is located to the north of the inferred fault and that well A-1 is located just south of the fault. RMT has used this improved understanding of the site geology and hydrology to optimize the locations for the remaining ground water recovery wells.

After viewing bedrock cores obtained during the installation of monitoring wells BW-201 and BW-202, RMT noted the presence of resistant quartzose layers. Quartz units such as these typically occur as a fracture fill. While constructing the access for well A-4, another of these quartz units was identified in the resultant exposure. As shown on Plate 2, this quartz unit comprises a northeast-southwest trending fault that dips to the north at approximately 70 degrees. It is likely that recovery well A-4 intersects this feature. Although these quartz layers appear to be continuous, it is more likely that they are fractured and broken. These quartz layers may also influence the horizontal and vertical transport of VOCs in the ground water by creating contaminant transport pathways. The additional site data obtained from the installation of recovery wells A-1, A-4, and B-4 has proved important to refining the remedial design for the ground water treatment system.

FILLS ARE NOT NECESSARILY ⊥ OR PARALLEL TO FAULT

NOT GOOD NEWS

3.1.3 Aquifer Characteristics

To better assess site ground water flow characteristics, two pumping tests were performed at wells A-4 and B-4, respectively. Water level data collected during these tests was used to calculate hydraulic conductivity, transmissivity, storativity, and the saturated thickness of the aquifer. These aquifer parameters have since been incorporated into a site ground water flow model which has been used to properly locate additional pumping wells and evaluate the effectiveness of the ground water recovery system.

The pumping tests conducted on wells A-4 and B-4 were completed in accordance with the Technical Memorandum (dated February 12, 1993) submitted by RMT to the US EPA. These pumping tests were used to address the uncertainty associated with the hydraulic conductivity test results obtained during the RI, confirm the number and location of recovery wells predicted by the capture zone modeling, and develop the basis for a site ground water flow model. The

site ground water flow model will be used to evaluate the effectiveness of the ground water recovery system in achieving the remedial objectives stated in the ROD.

3.2 Process Description

RMT's conceptual process design for the Medley Farm Site remedy generally consists of a portable soil vapor extraction (SVE) system for treatment of the VOC-affected soils, a system of jet-pump ground water extraction wells for removal of VOC-contaminated ground water, a low profile air-stripping unit for treatment of the affected ground water, and a diffuser system for discharge of the treated ground water through a NPDES-permitted outfall to Jones Creek.

A more detailed process narrative for each of the ground water treatment and soil vapor extraction systems is provided in Sections 3.2.1 and 3.2.2. At this time, the design criteria for each of these systems is based upon the assumption that air emissions from both the ground water and soil removal systems will not require treatment to achieve minimum SC DHEC air quality requirements, per letter from SC DHEC Bureau of Air Quality Control dated December 29, 1992 (Appendix E).

3.2.1 Ground Water Recovery and Treatment System

Ground Water Recovery

Dual (System A and B) jet pump collection systems have been selected for use at the Medley Farm Site. Each of these systems is intended to function independently of one another, yet they both are intended to collect ground water from within a discrete portion of the plume of VOC constituents. A generalized arrangement of the Medley Farm remedy is shown in Figure 3-1.

hooray!

The remedial design for the Medley Farm Site has been developed to accommodate a degree of flexibility with respect to possible changes and modifications that may become necessary in response to changing site conditions or remedial objectives. A review of the text and drawings provided herein will illustrate the provision for a third jet pump system (reference DWG. 938-C03), should the need arise. At this point in time, dual jet pump systems A and B are believed to be adequate to address the site remedial objectives. The third system (System C) is shown only to emphasize the fact that the design does take future contingency measures into account.

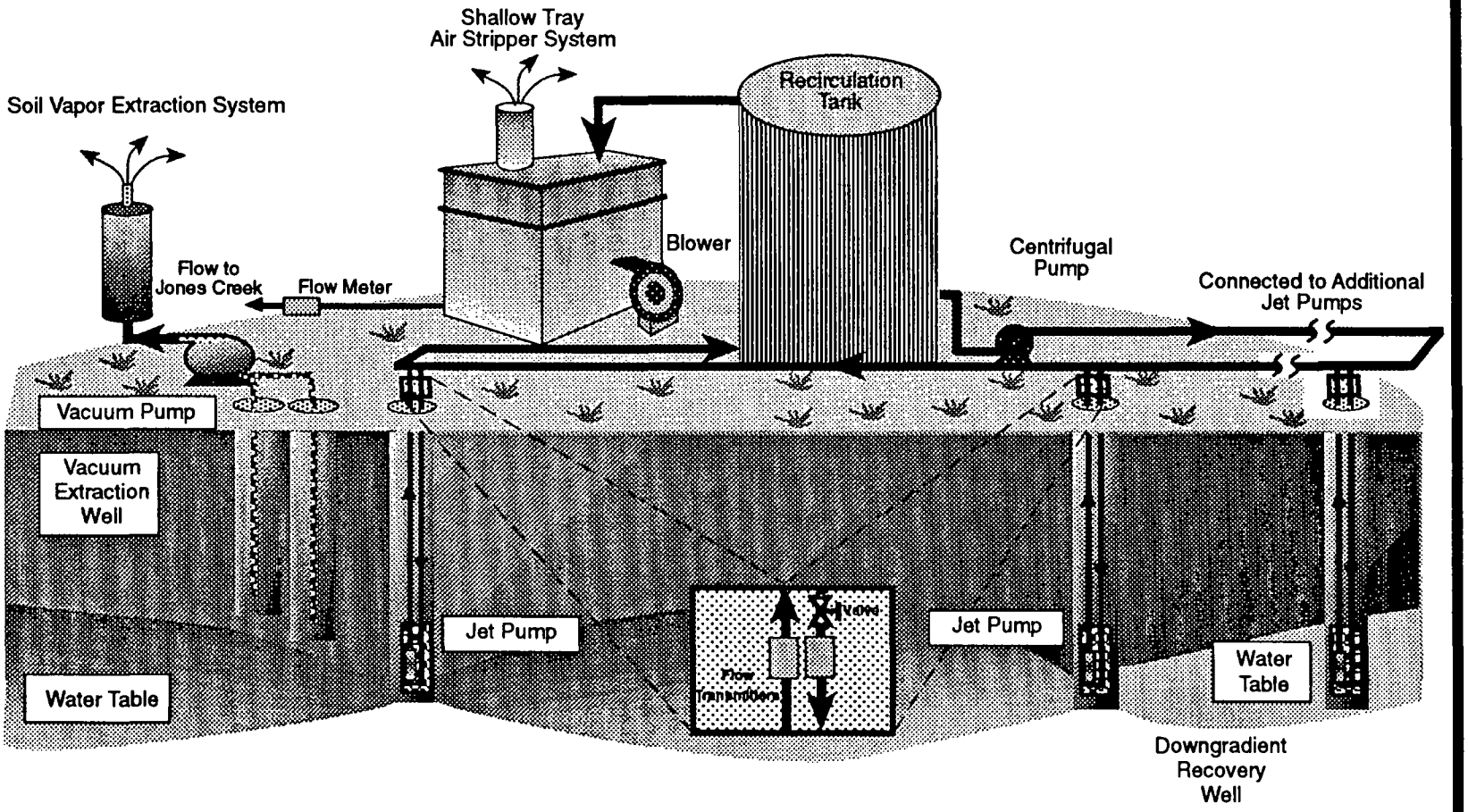
? CAN'T SEE SYSTEM C ON 938-C03

A jet pump recovery system is intentionally designed as a reliable and uncomplicated means of extracting ground water from the subsurface and conveying it to a centralized treatment system. The most important components of a jet pump system are the centrifugal pump (prime mover), the jet pump ejector, and the associated piping. Figure 3-1 provides a conceptual view of these various components as they interact with one another. The jet pump ejector is installed near the bottom of each pumping well. Each pumping well will be constructed as shown in Figure 3-2. The prime mover for each system is used to maintain a minimum flow of water through the ejector, which in turn exerts a negative pressure or suction on the ground water present in the well. The momentum transfer that occurs within the ejector's venturi assembly imparts a vacuum of sufficient strength to induce flow out of the well and into the collection piping.

This type of ground water extraction system is reliable, cost effective, and does not require complicated control systems. In cases where the well is pumped to dryness, the jet pump merely draws air into the system. To facilitate long-term system operations and monitoring, RMT has found it useful to include flow meters, check valves, and throttling valves at select locations throughout the system. A general process flow diagram for the jet pump ground water extraction system at the Medley Farm Site is presented in Drawing 938-C04.

Recirculation System

The dual jet pump extraction systems for the Medley Farm remediation will hereinafter be referred to as System A and System B, respectively. Systems A and B are each provided with a dedicated centrifugal pump. Each of these two systems share a central recirculation tank shown on the PFD. This central recirculation tank serves as the point of suction for both prime movers and provides the water supply necessary to maintain the minimum water flow throughout each of the respective ground water recovery systems. The accumulated discharge from all of the jet pump extraction wells recirculates out through each system and returns with the additional water collected from each extraction well. As the water level increases, the recirculation tank is provided with an overflow through which the excess return water flows by gravity to the low-profile air stripping system.



RMT INC
93811
0593
Engineering and Environmental Management Services

FIGURE 3 - 1

Conceptual Process Approach

MAY 1993

Medley Farm Site
Gaffney, South Carolina

J:\CAD\GRAPHIC\938\938RWC-2.DWG

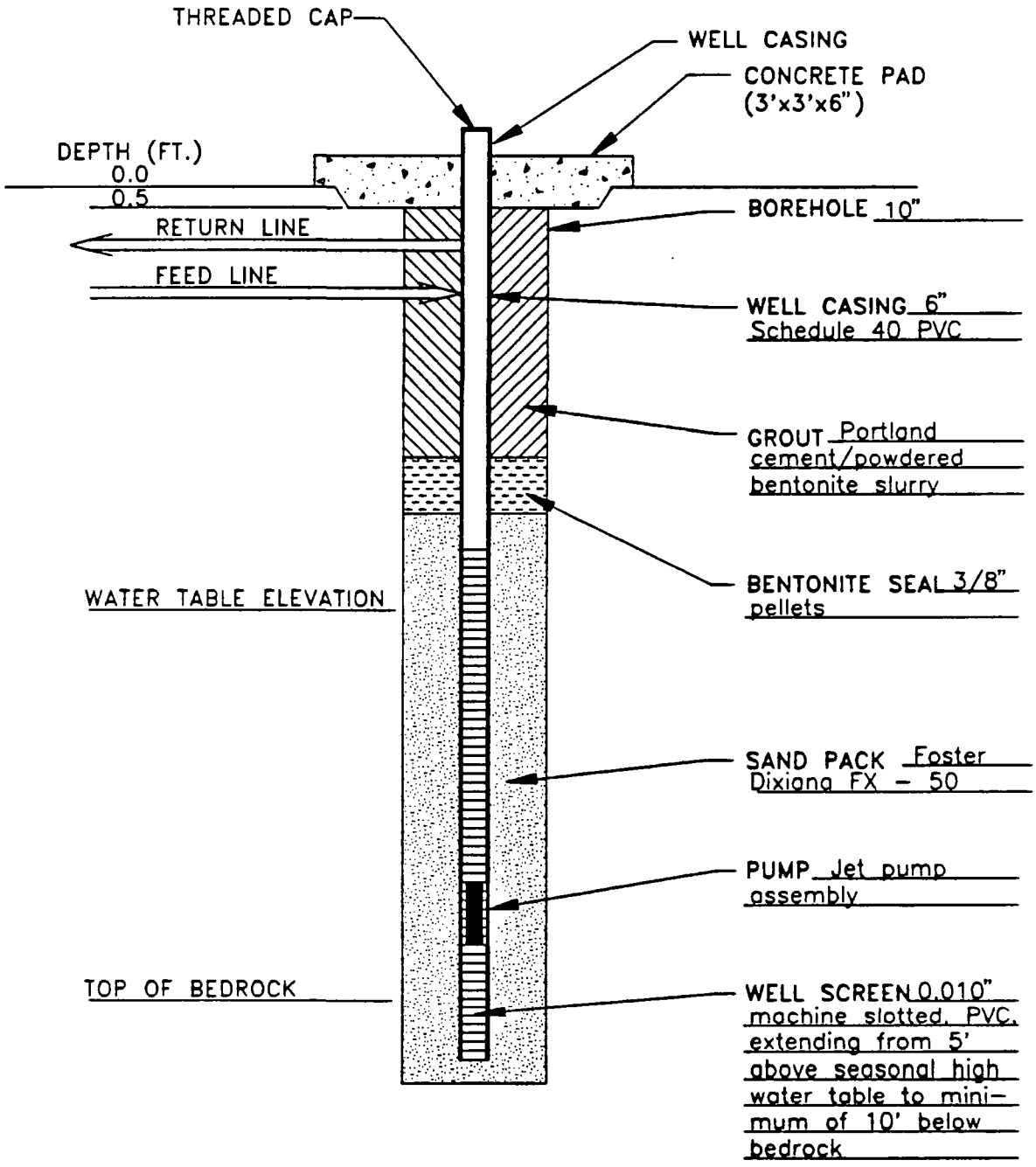


FIGURE 3-2

GROUND WATER EXTRACTION WELL CONSTRUCTION SCHEMATIC

Not To Scale

RMT INC.

This recirculation tank is sized to accommodate approximately 110 percent of the total required volume of water necessary to maintain minimum flow within Systems A and B. Level sensors are used to monitor the water level within this unit to ensure that the water level tank does not get too low or overflow. In the event of high or low water alarms, a signal is transmitted to the central control panel, which then disrupts the power supply to one or both of the prime movers, effectively shutting the system down until the operator can resolve the problem.

Low-Profile Air Stripper

The extracted ground water overflows the recirculation tank and flows by gravity to the top of the low-profile air stripper unit (Figure 3-3). Once here, the water flows across the upper distribution tray of the air stripper where it is uniformly distributed over a pattern of 3/16-inch diameter holes through which a continuous stream of air is passed. The extracted ground water then drains by gravity through several trays (maximum of 4) to a sump located at the bottom of the air stripper. As the extracted ground water passes downward through these trays, an air stream is continuously forced upward through the ground water by an air blower.

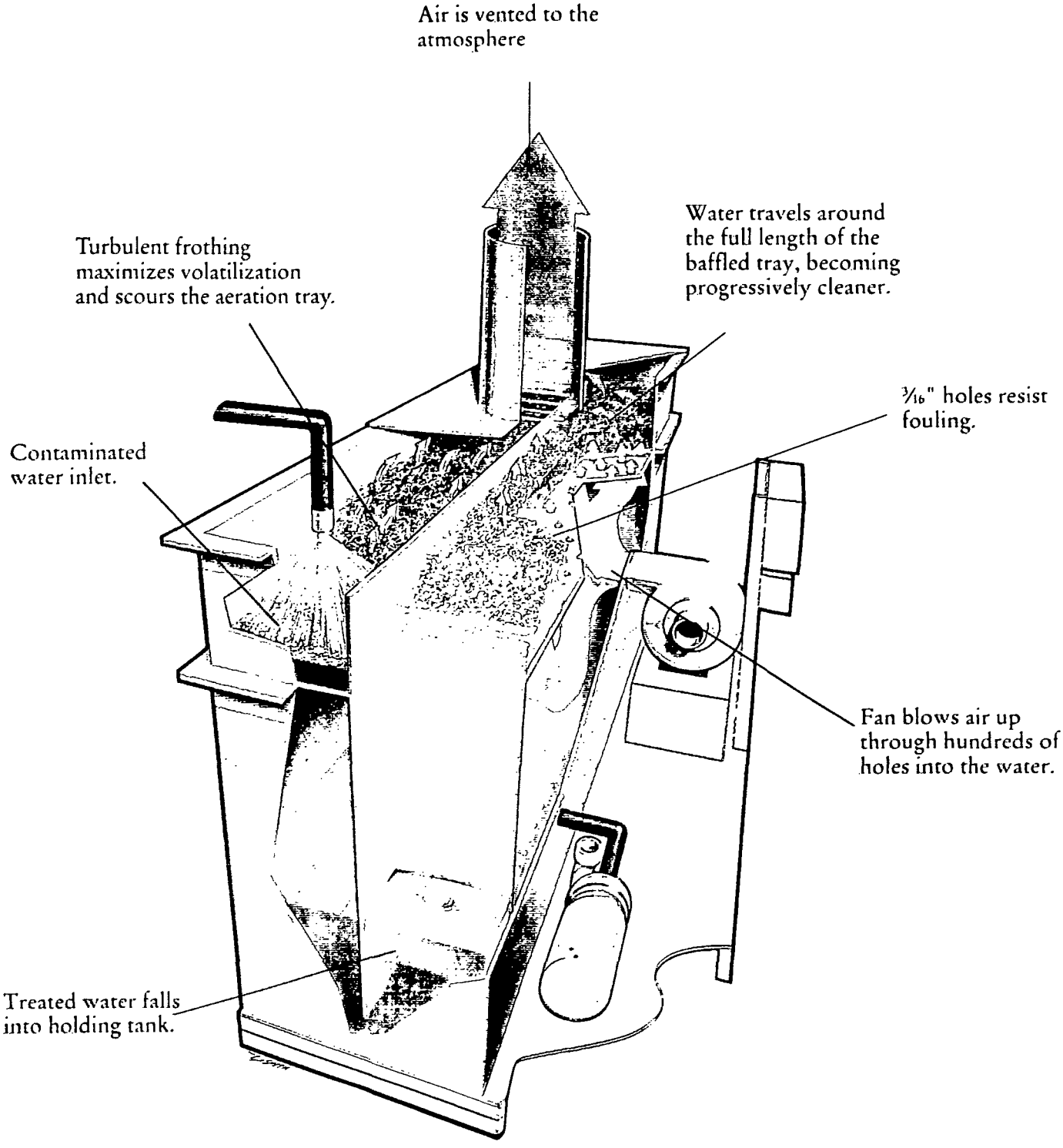
This counter-current flow of extracted ground water and air induces mass transfer of VOCs from the ground water into the air stream. In this manner, VOCs are stripped from the water phase and introduced to the air phase. Treated ground water then flows by gravity from the low-profile air stripper through a flow-measuring flume and on into the discharge pipe to the NPDES outfall on Jones Creek.

3.2.2 Soil Vapor Recovery System

Soil vapor recovery will be used to remediate unsaturated zone (vadose zone) soils in three areas designated by the Record of Decision (ROD) and shown on Drawing 938-C05. These areas of the site were identified by US EPA as having the potential to provide a long term source of VOC to the ground water.

Soil Vapor Extraction (SVE) Wells

A series of eight vapor extraction wells will be installed within the three areas described by the ROD and piped to a central vacuum pump by way of a common header. The arrangement for



PHOTOGRAPH TAKEN FROM SHALLOW TRAY AERATION SYSTEM (NORTH EAST ENVIRONMENTAL PRODUCTS, INC.)

FIGURE 3-3

LOW-PROFILE AIR STRIPPER

RMT INC.

938.11
0493

MEDLEY FARMS SITE
GAFFNEY, SC

this system is shown on Drawing 938-C05. Figure 3-1 also depicts the general manner in which vapor extraction wells are intended to relate to ground water extraction wells. Soil vapor extraction wells will generally be installed approximately ten feet above the mean high ground water elevation. A typical construction diagram for a soil vapor extraction well is shown on Figure 3-4.

Soil vapor extraction wells will be constructed using two-inch schedule 40 PVC piping. The screened interval for these wells will be approximately ten feet above the mean high water elevation to the surface. The screens for the soil vapor extraction wells will be 30 feet in length and will be 0.020-inch continuous slotted.

Treatability testing of the SVE system was conducted in February 1993. These treatability tests indicate that a system of eight soil vapor extraction wells will be necessary to address the required vapor extraction operations designated by the ROD. A single vacuum system will be adequate to induce the required air flow from the soils. The process and instrumentation flow diagram for this system is shown on Drawing 938-C04. System details are provided on Drawing 938-C11.

Generally, the soil vapor extraction wells are piped into a central header which leads to the centrally-located vacuum unit. The vacuum piping will be bedded in a shallow trench to address the potential for vandalism. In areas of known vehicular traffic, the vacuum piping may also be protected by a steel casing to prevent crushing. As vacuum is applied to the site soils, recovered vapors will flow through the four-inch pipe header, into the vacuum unit and then be discharged to the atmosphere. The vacuum header will be installed at a continuous grade to prevent condensate from accumulating in the pipeline. In this manner, condensate not collected by the condensate trap will flow back to the nearest SVE well.

The vacuum unit to be utilized for the Medley Farm Site remediation will be pre-engineered, prefabricated, trailer-mounted, and piped and wired by a vendor to be selected during the RA. The major components of this system are described, below. The technical specifications for this system are provided in Appendix F of this report.

J:\CAD\GRAPHIC\938\938SVC-1.DWG

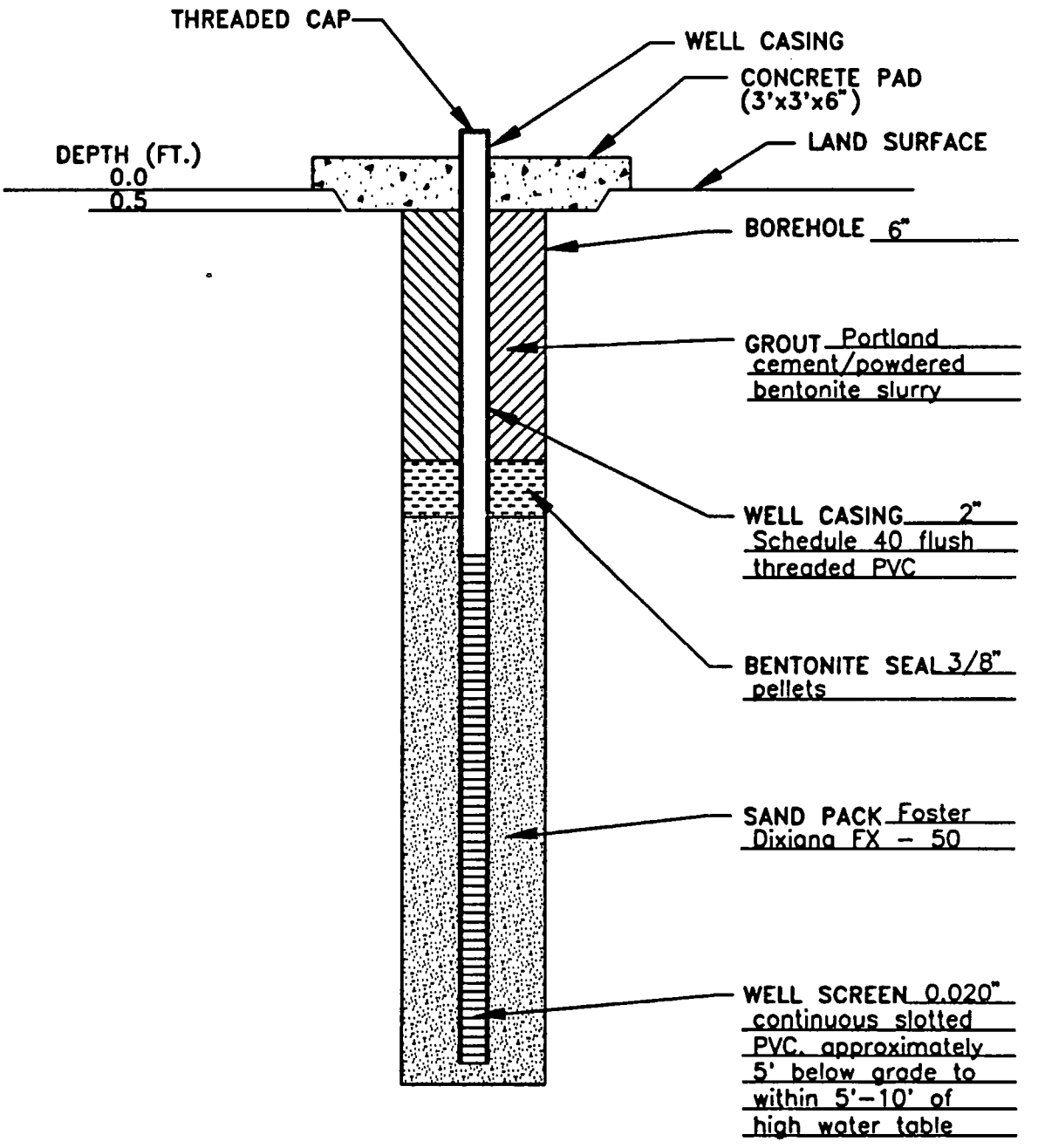


FIGURE 3-4

SOIL VAPOR EXTRACTION WELL SCHEMATIC

Not To Scale

RMT INC.

Condensate Trap

Prior to entering the vacuum unit, extracted vapors will first pass through a condensate trap. The purpose of this unit is to remove entrained water vapor from the air stream before it passes through the vacuum pump. Water will collect in the bottom of this trap as time progresses. A high level shut-down will address situations where too much condensate has collected. A drain will be manually opened to periodically remove this water from the SVE system. This water will be discharged either to the recirculation tank or the air stripping unit for treatment prior to discharge to the Jones Creek NPDES outfall.

Air Filter

The air vapor will then pass through a high efficiency particulate filter to remove fine particle solids prior to their entry into the vacuum unit. Pressure gages located upstream and downstream of the unit will be used to monitor the pressure drop across the filter.

Air Intake

Make-up air is provided through a filtered air intake. A globe valve is positioned on this line to precisely regulate the amount of make-up air that is bled into the system. A flow meter and pressure gage are situated upstream of this globe valve to monitor intake conditions. Make-up air is necessary for starting the vacuum system under no-load conditions and to operate the system at variable levels of vacuum and vapor flow.

Inlet/Discharge Silencers

In-line silencers are installed on both the inlet and discharge sides of the vacuum pump to reduce the noise level during site SVE operations. In addition, the hours of operation will be limited to daylight hours by placing the SVE system power feed on a timer.

Vacuum Pump

The vacuum pump will be a rotary lobe, positive displacement pump capable of providing at least 500 SCFM under no load conditions, and capable of operating up to a vacuum of 140 inches of water (10.3 inches mercury).

A vacuum relief valve will be located immediately upstream of the vacuum pump. A temperature sensor will be located immediately downstream of the vacuum pump. If discharge temperature exceeds normal operating temperature, the temperature sensor will transmit a signal to the control panel and pump operation will cease. A high level signal from the liquid level sensor in the condensate trap will also cause the vacuum pump to shut down. A temperature indicator and a pressure gauge on the discharge piping will allow the operator to monitor the physical condition of the air discharge stream.

Discharge Stack

Recovered soil vapors and make up air will be discharged to the atmosphere through a 15-foot high discharge stack. The materials of construction for this stack will be six-inch schedule 40 PVC pipe. A sample port will be located at the base of the stack for sampling the discharge stream, if required.

3.3 Project Delivery Strategy

The general project schedule for the Medley Farm Site Remedial Design was first presented in Section 5 of the Remedial Design Work Plan. This RD schedule established RMT's time-frames for providing the required project deliverables and documented assumptions regarding the time required for US EPA and SC DHEC reviews.

Following US EPA approval of the RD Work Plan, RMT submitted a detailed delivery schedule for all RD documents in a September 8, 1992 letter to the US EPA. The delivery schedule for the Medley Farm RD documents was based upon the following deadlines:

DESIGN ACTIVITY	*PLANNED DURATION*	*DELIVERY DATE*
1) Submit Preliminary Design	**2.5 Months**	**November 20, 1992**
2) Receive US EPA Approval	**1.5 Months**	**December 31, 1992**
3) Submit Prefinal Design	**5.0 Months**	**May 28, 1993**
4) Receive US EPA Comments	**1.5 Months**	**July 9, 1993**
5) Submit Final Design	**1.5 Months**	**August 27, 1993**

End July to Committee

This Prefinal Design Submittal constitutes the second major deliverable under this schedule. The delivery schedule for the Final Design Submittal is predicated upon a 1.5-month duration from the date Agency comments to the Prefinal Design Report are received.

3.4 Design Criteria

The Statement of Work (SOW) for the Medley Farm RD/RA specifies that the design criteria for the project must be prepared and submitted for Agency review. The design criteria that have been provided in Section 3.4.1 through 3.4.12 are submitted in response to this SOW requirement. These design criteria are intended to outline and describe the major design, operational, and maintenance considerations that have been used as the basis for design of the ground water and SVE treatment systems. These design criteria have been developed to address the technical and regulatory issues and objectives defined by the US EPA's ROD and SOW developed for the Medley Farm Site.

These design criteria provide the foundation for development of the facilities necessary for implementation of the ROD-selected remedy and are based on RMT's current knowledge and understanding of site conditions as they existed at the time of this Prefinal Design report's preparation. The design criteria set forth in this section may be modified, on an as-needed basis, in response to technical considerations arising from field treatability studies, changes in observed hydrogeological characteristics, and observed deviations from previously defined site conditions.

3.4.1 Applicable Codes, Standards, and Regulations

RMT is aware of no applicable building codes which affect the design of the SVE and ground water treatment systems described herein. All facilities described in this document are to be designed and constructed in accordance with applicable regulations set forth by the South Carolina Department of Health and Environmental Control (SC DHEC), and affected Cherokee County Agencies. Furthermore, all design work is to be conducted in accordance with requirements set forth in the Record of Decision, Consent Decree, and Statement of Work jointly negotiated and agreed to by the Medley Farm Site Steering Committee (Steering Committee) and the US EPA and SC DHEC.

3.4.2 Horizontal and Vertical Controls

Horizontal and vertical controls for the site were set during the course of generating the site topographic map used during the RI/FS. Survey monuments used during the RI/FS and the RD/RA will also be used for lay-out and construction of the new facilities described herein. These survey monuments include the following provided in Table 3-1:

TABLE 3-1

HORIZONTAL AND VERTICAL CONTROLS

	Coordinates		
Monument Description	***Northing***	***Easting***	***Elevation (ft above MSL)***
#10	9406.9	7136.7	682.64
#13	88489.0	7677.3	615.97
Iron Pin (A)	9039.98	7177.73	664.98
Iron Pin (B)	9219.58	7502.19	668.62

3.4.3 Earthwork

- The major source of earthwork for this project will be access road construction, grading around the pump pads, and excavation/backfill for underground piping and valve pit installations.
- Slopes excavated during access road construction shall not be steeper than 2:1 (horizontal:vertical).
- Diversions created as a part of this excavation shall maintain a slope of greater than 0.5 percent to selected discharge points. Refer to Section 3.4.5 Storm Drainage for more information on access road diversions.
- If fill material is to be placed on slopes greater than 4:1 (horizontal:vertical), the receiving slope shall be benched to ensure the stability of the embankment.
- A stability analysis shall be conducted, using currently available site data, to determine adequate bench dimensions.
- Fill materials shall be placed at a minimum density of 95 percent standard proctor at optimum moisture content.
- Earthwork around the pump pad shall be completed to provide a proper foundation for the slab and ensure positive drainage away from the facility.

- Trenching activities shall be done in accordance with OSHA requirements. Bedding materials shall be sand or washed stone compatible with the selected pipe material.

- Trench backfill shall be compacted to a minimum of 95 percent standard proctor at optimum moisture content.

3.4.4 Roads

Site roads will meet the following minimum requirements:

- Site access roads shall be limited to a maximum ten percent grade.

- Access roads shall have a minimum width of 16 feet to facilitate movement of drilling/trenching equipment, construction traffic, and maintenance vehicles during construction and site operations.

- Recommended construction of site access roads should consist (at a minimum) of a geotextile underlayment (MIRAFI 600 or equivalent) followed by a crushed stone cover (minimum depth of six inches) to minimize long-term maintenance.

3.4.5 Storm Drainage

Storm drainage features for this project include access road diversion ditches, access road culverts, diversions around the pump pad, and a level spreader to disperse the water collected by the pump pad diversions. Storm drainage features will meet the following requirements:

- The design storm event for all storm drainage structures shall be the 10 year/24 hour event.

- All facilities will be checked against the 25 year/24 hour event (?)

- For Cherokee County, South Carolina, the ten year/24 hour storm event is approximately 5.1 inches of rainfall and the 25 year/24 hour storm event is approximately 5.9 inches of rainfall.

- Access road diversion ditches shall have a minimum slope of one percent and a maximum slope of ten percent.

- Velocities within these ditches shall be limited to four feet per second or less, without a protective lining (either matting or riprap).

- Culverts will discharge water from these ditches to the Jones Creek side of the access road.

- Culverts will be spaced to limit ditch velocities and culvert discharge velocities.

- The minimum culvert slope shall be one percent.
- Velocities in the culvert discharge channels to Jones Creek shall be held as low as practicable.
- Pump pad diversions shall have a minimum slope of 0.5 percent. These diversions shall not constitute major drainage control features, but shall be used to promote positive drainage in the area immediately adjacent to the pump pad.

3.4.6 Erosion Control

All site activities have been designed and will be conducted in accordance with Cherokee County erosion control ordinances and regulations, and will meet the following requirements:

- Erosion control measures will be utilized during construction and shall consist of filter fabric silt fences placed downhill of construction activities, rock check dams spaced evenly in newly constructed diversions, and hay bales (wherever specified).
- Permanent erosion controls will consist of an erosion control mat placed, when necessary, on a slope or in a ditch to hold soil in place until a suitable vegetative root system can be established that will hold the soils in place. This mat may consist of either wood fiber or geosynthetic materials.
- Rip-rap or other suitable armoring methods may be utilized, depending upon the ditch/culvert velocities encountered.

3.4.7 Ground Water Extraction Wells

Modelling Evaluation

- The initial location of ground water pumping wells provided in the Preliminary Design Report was based upon Capture Zone analyses using the US EPA's Well Head Protection Model (GPTRAC Module).
- The Capture Zone model was also used to identify the locations for three permanent six-inch pumping wells (A-1, A-4, and B-4). These pumping wells were installed in January 1993 for the purpose of conducting formal pumping tests which will, in turn, provide the necessary data for development of a site-wide ground water flow model. The installed locations for these first three ground water extraction wells are depicted on Drawing 938-C03.
- Formal pumping tests and analyses were conducted on pumping wells A-4 and B-4 that are to be located near existing wells SW108/BW108 and SW-4, respectively. These tests were conducted in the February-March 1993 time interval. The third pumping well (A-1) was sampled for additional water quality and water table measurements to fill an important data gap.
- The results of the pumping tests conducted on wells A-4 and B-4 have been used to calibrate a site ground water flow model (MOD-FLOW) to be used as a guide for

tracking the overall effectiveness of the ground water capture/containment system, as addressed by the objectives of the ROD and SOW.

Locations

- Using MOD-FLOW, RMT has identified locations for 11 ground water extraction wells as shown on Plate 5.
- Ground water extraction wells will be installed to a minimum depth of ten feet within competent bedrock, as defined by the hydrogeologic properties of the rock encountered. This means that bedrock must exhibit fractured media flow characteristics before it will be considered competent rock. Weathered bedrock that continues to exhibit porous media flow characteristics will be treated similar to the overlying saprolite.
- Extraction wells will be installed using air rotary drilling techniques. Diamond coring techniques may be employed if additional stratigraphic information is required.
- Extraction wells will be constructed of six-inch Schedule 40 PVC.
- Extraction wells will be screened from the bottom of the borehole to approximately five feet above the observed water table. All well screens will be 0.01-inch machine-slotted.
- All downhole construction materials will be threaded, flush-joint PVC.
- Feed and return lines to extraction wells will be constructed below grade to minimize opportunities for possible vandalism. Pitless adapters will be used to make the construction connection (per Drawing 938-C12).

Basis for Sizing

- Ground water extraction wells will be constructed as six-inch wells (minimum) to facilitate installation of the jet-pump assemblies.
- Schedule 40 PVC materials of construction for casing and screens.
- Screen slot size to be 0.010 inch.
- Well construction is described by Figure 3-2.

3.4.8 Ground Water Extraction System

Piping

- Piping for the ground water extraction systems will consist of a circulating system which will convey water to/from jet pumps to be installed within each permanent pumping well.

- Piping along the main loop will be sized to minimize friction losses.
- The main piping loop will also be sized to accommodate the installation of additional extraction wells other than those called for in the Final Design Report.
- Refer to Section 3.4.3 Earthwork for additional details regarding trenching, bedding, and backfilling requirements.
- Underground pipes shall have a minimum of three feet of cover.
- Pipe materials to the pumping wells shall be Schedule 80 Polyvinyl Chloride (PVC).
- Piping materials within the pumping wells shall be Schedule 80 PVC and an industrial hose material, specified on the design drawings. The industrial hose material shall be PVC with a synthetic, high tensile cord reinforcement (rated to a maximum water pressure of 500 psi and having a minimum ten-inch bending radius).
- Exposed piping, pumps, and valves shall be heat traced and insulated to minimize freezing during winter operations.
- Thrust blocks for the system will be designed based upon a specified test pressure of 225 psi.
- Piping taps shall be installed at intermittent locations to facilitate temporary clean-outs or chemical additions.

Jet Pumps

- Jet Pumps shall be sized to extract the desired flow from each of the pumping wells. The pressure required at each jet pump shall be minimized to produce the desired ground water recovery rate.
- Jet pumps shall be designed to push the design flow against the maximum head from the respective jet pump location to the recirculation tank, with a net positive suction head of zero.
- The jet-pump assembly will be installed at the theoretical depth of maximum draw-down as established by ground water modelling efforts such that the net suction head is zero.
- The required design flow for each jet pump venturi will be established as a result of ground water modelling efforts.

FINAL

? GW? OK...

Valves and Meters

- Valves and meters shall be rated at 200 psi service.
- Globe valves will be used for those applications requiring flow control.

- Ball valves will be used for those applications requiring system isolation.
- Meters shall be located a minimum of ten pipe diameters from the nearest valve.
- A recorder shall send flow data to a centrally located display panel, which shall provide the operator with a total flow into and out of each pumping well.
- Strainers shall be installed on the suction side of all pumps to guard against possible damage from larger solids inadvertently introduced into the system.
- Valve and meter pits shall be a minimum of 3 ft. X 5 ft. to facilitate construction and/or maintenance activities.
- Water level measurements are to be provided for each extraction well.

Pump Stations

- A separate pumping system will be used to operate each leg of the ground water extraction system (labelled as Systems A and B on the drawings).
- An additional System C is shown on the drawings for possible use in the future should the need be identified.
- The pumps for these systems shall be horizontal centrifugal pumps rated for continuous service.
- Each of these pumps shall be sized to pump the total flow required to achieve the desired ground water extraction rate, any additional incremental flow recovered from each well, and a minimum circulating flow of 25 gallons per minute.
- Worst-case analysis will be used to calculate the maximum head each pump must overcome to deliver the required flow at the required pressure.

Tanks

- The recirculation tank for the pumps shall be sized to hold 110 percent of the total volume of piping anticipated to be in service.
- Tank shall be constructed of fiberglass or other suitable material submitted to and approved by the Engineer.
- Tank will have top and be opaque to light to limit algal growth.

Pump Pad

- Pumps, tank, and air stripper shall be located on a concrete pad centrally located with respect to the ground water plume and Jones Creek.
- The pad must be sized to accommodate future expansion or equipment additions.
- Pad shall be designed using a soil bearing pressure of 2,000 pounds per square foot.
- Concrete shall be a minimum 4,000 psi mix and have reinforcing steel of adequate size and spacing for the specified loading conditions and soil strength.
- Pad shall be surrounded by a six-foot security fence topped with three-strands of barbed wire.
- Pad shall have a shed roof constructed of structural steel and have adequate clearances for all pad equipment.

3.4.9 Soil Vapor Extraction System

Extraction Wells

- Two-inch vapor extraction wells are to be utilized at locations described in Drawing 938-C05.
- Construction details for SVE wells are provided in Figure 3-3.
- Schedule 40 PVC materials of construction for casing and screens.
- Screen slot size to be 0.020 inch (continuous slot).
- Filter pack to consist of coarse to medium grain silica sand (Foster Dixiana 99 or equivalent).
- SVE wells to be screened through the unsaturated soil zone to no closer than ten feet of the seasonal high water table.
- SVE wells to be installed using air-rotary or hollow stem auger drilling techniques.
- SVE wells have been located within the three areas specified by the ROD.
- In-place testing of SVE wells VE-101 and VE-301 has been conducted to facilitate development of prefinal/final design configuration presented herein. This testing involved installation and monitoring of the influence radius for these wells to confirm the overall basis for design of the remaining SVE wells.

Vacuum Monitoring Wells

- One-inch vacuum monitoring wells have been installed at locations described on drawing 938-C05.
- Construction details for VMWs are provided in Figure 3-4.
- The materials of construction to be used for VMWs will consist of Schedule 40 PVC casings and screens.
- VMW screen slot size to be 0.010 inch (circum-slot).
- VMWs are to be screened in the unsaturated soil at intervals to be specified in the field. The maximum depth of any VMW well may be within ten feet above the seasonal high water table.
- VMWs are to be installed using air-rotary drilling techniques.
- VMWs are to be used during system operation to monitor the influence radius at various depths and locations to confirm the overall basis for design of the SVE system.

Vacuum Piping

- Piping for the SVE system will consist of two-inch PVC piping leading from each of the vacuum extraction wells to the central four-inch pipe manifold lines. The main pipe manifold lines will convey soil vapor from each of the three SVE well fields to the centrally located vacuum unit.
- SVE manifold piping will be sized to accommodate the installation of 50 percent more SVE wells than are called for as a result of the final Design Report.
- Vacuum piping and manifold lines to be constructed of Schedule 40 PVC.
- Vacuum lines will be socket-cement welded.
- Vacuum lines will be buried in a shallow trench to minimize potential for vandalism.
- Condensate trap and filter to be utilized ahead of vacuum pumps to protect unit from water/particulate debris.
- Vacuum lines crossing high traffic areas will be encased with a protective steel casing.

j:\cad\graphic\938\938vw-1.dwg

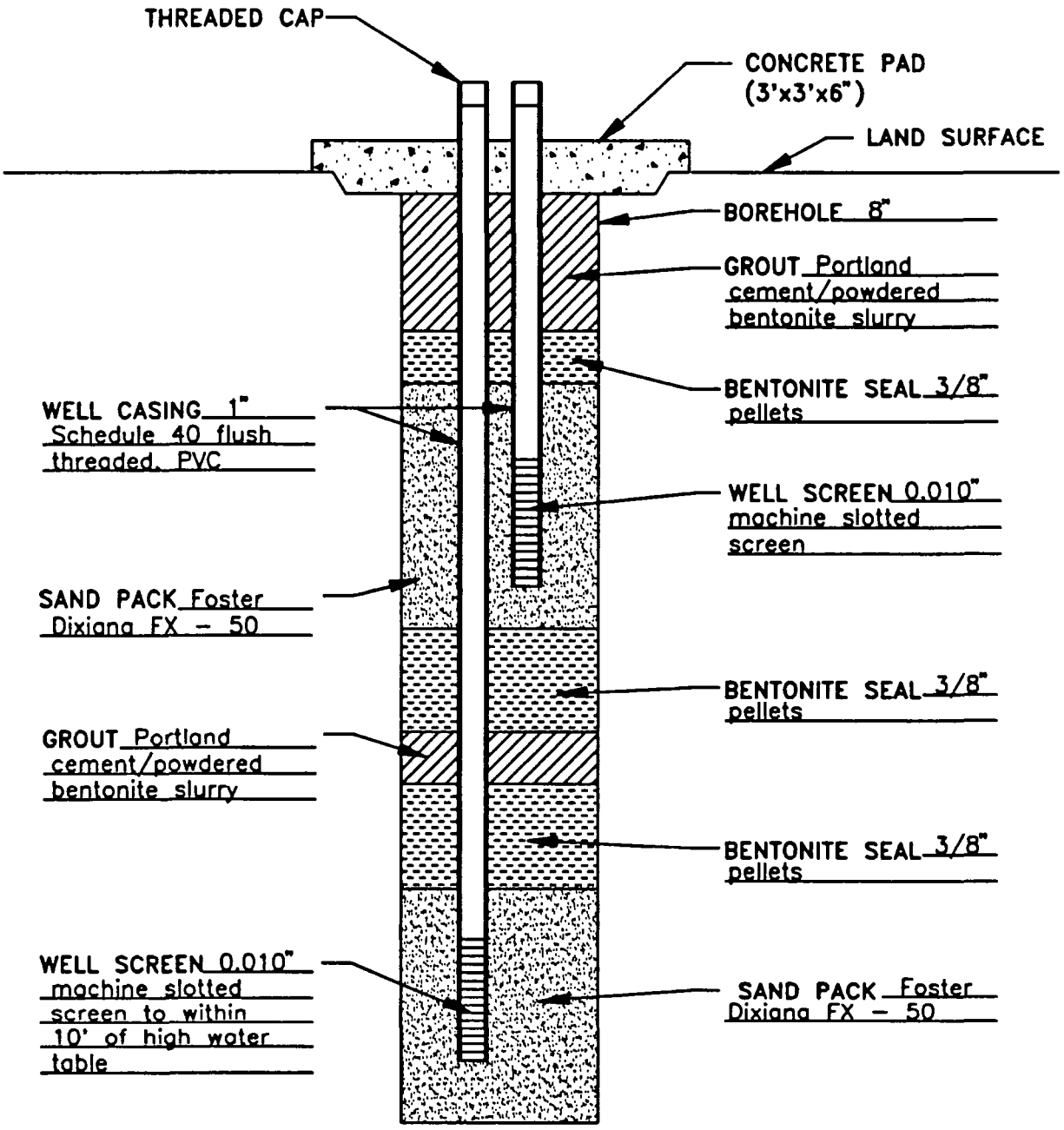


FIGURE 3-5

VACUUM MONITORING WELL SCHEMATIC

Not To Scale

RMT INC.

Vacuum Pumps

- The vacuum pump will be a rotary lobe blower as manufactured by Roots or equal. The pump will consist of a cast iron casing, hardened alloy steel gears, and cast iron involute impellers.
- The vacuum pump will be sized to deliver 175 percent of the combined SVE well yields at the design vacuum. The combined extraction well yields is equal to 8 times the optimum well yield obtained during the in-place testing.
- The design vacuum is equal to 115 percent of the vacuum under which the optimum well yield during the in-place testing was achieved, plus a design factor to account for system and piping losses. At a minimum, the SVE system will be operated at a vacuum of approximately 100 inches of water column.
- A vacuum relief valve will be located immediately upstream of the vacuum pump and will fully open at a vacuum of no greater than 110 percent of the design vacuum. The vacuum relief valve shall be sized to provide 100 percent of the process air at a fully open position.
- Silencers are to be provided on air inlets and outlets to minimize noise. The silencers are to be combination chamber, absorptive type silencer with a double shell construction.
- Positive displacement vacuum pumps to be used. Rotary lobe type as manufactured by Roots, Sutorbilt, or similar.
- To address additional noise abatement SVE system sill be operated on a timed basis limiting its hours of operation to daylight hours only.

CHECK THIS...

Monitoring Systems

- Sample ports to be provided on inlet and outlet sides of vacuum pump(s).
- Vacuum gages to be provided on inlet piping and air intake line.
- Pressure gages to be provided on discharge piping.
- A temperature indicator is to be provided on discharge piping.
- Air flow meters to be supplied on inlet piping and air intake line.
- Vacuum monitoring wells to be utilized in field to establish radius of influence of SVE wells.

3.4.10 Air Emissions

Process Design

Air emission controls are not applicable for this project at this time. (Reference SC DHEC BAQC Permitting Waiver in Appendix A).

3.4.11 Ground Water Treatment and Discharge

Process Design

- The air stripper shall be a low-profile, tray-type using a forced draft of counterflow ambient air to affect the removal of dissolved volatile organic compounds from the ground water.
- The air stripper shall be capable of treating water at flow rates up to 150 gpm. Incoming water will be extracted ground water at a temperature of 16 to 18° C.
- The air stripper will be designed for outdoors installation.
- The air stripper shall be prepiped and prewired to the degree most practical for ease of installation.
- The air stripper shall be provided with all necessary process connections including but not limited to the following:
    - water inlet
    - water discharge
    - stripping air inlet
    - level transmitter
    - level switch
    - centrifugal air blower
    - air flow transmitter
- Water will enter the top of the air stripper by gravity discharge from the recirculation tank.
- The air stripper will distribute the inlet water flow across a stainless steel (or accepted equivalent) aeration tray designed to induce turbulent frothing of the ground water and maximize volatilization of the dissolved VOCs.
- The air stripper will be designed for a maximum of three aeration trays.
- One centrifugal air blower will be required to provide air to the base of the air stripper.
- The air blower will be provided with all guards necessary to shield belt and/or drive from operator.

- An air stripper shall be a Shallow Tray model 31231 (or approved equivalent).
- VOC concentrations in the air stripping effluent stream will be designed to meet Water Quality Criteria (WQC) limitations established for the NPDES permits. These limits have not been officially released by SC DHEC and are pending. In the event WQC limits are lower than instrument detection limits, then the system discharge limits shall be based on the available laboratory detection limit. Table 3-2 summarizes current VOC influent and effluent concentrations that have been used for design purposes.

Instrumentation

- Instrumentation panels to be designed for outdoor service (NEMA 3R or higher).
- Centralized control/monitoring panel to provide equipment status, flow, and operating data for operator use.
- Continuous recording and totalizing of NPDES discharge to Jones Creek is required.
- Low/high level interlocks required for tanks and treatment equipment.

TABLE 3-2

PREFINAL DESIGN VOC INFLUENT AND EFFLUENT CONCENTRATIONS

VOLATILE ORGANIC COMPOUND	HIGHEST OBSERVED VOC CONCENTRATIONS (ppb)	MONITORING WELL NUMBER	DESIGN EFFLUENT CONCENTRATION (ppb) [a]	REQUIRED REMOVAL EFFICIENCY (%)
Benzene	2	BW108	1.2	40.0
Chloroform	9	BW108	5.7	36.7
1,1 Dichloroethane	5	BW108	350	NA
1,2 Dichloroethane	650	BW02	0.50	99.92
1,1 Dichloroethene	400	BW02	0.57	99.88
1,2 Dichloroethene (Total)	37	BW108	70	NA
Tetrachloroethene	560	BW108	5	99.1
1,1,1 Trichloroethane	61	BW108	200	NA
Trichloroethene	920	BW108	2.7	99.7

a Design effluent concentrations are based on US EPA Freshwater Chronic Aquatic Toxicity values and lowest Practical Quantitation Limits (PQL) for those organic compounds having aquatic toxicity values below the PQL

NA Not Applicable

3.4.12 Electrical

The electrical requirements for this project will meet the following requirements:

- Power line separate from property owners to be brought in.
- Overhead power distribution to be used.
- Security lighting to be provided on designated power distribution poles.
- All electrical and power supply equipment to be designed for outdoor service (NEMA 4 or higher).
- Instrumentation will be provided to permit inspection of system operation by operator from single control panel.
- Control logic will be developed to minimize required time on-site by operator.
- Instrumentation (lights, annunciators, etc.) will be provided to assist operator in quickly identifying problems that initiate system shut-down.

3.5 Permitting Strategy

3.5.1 NPDES

RMT's approach to obtaining the necessary NPDES permit during the remedial design has involved two distinct phases. Phase 1 involved completion and submittal of EPA Form 2D (New Sources and New Dischargers: Application For Permit to Discharge Process Wastewater) to SC DHEC for review. In this phase of the permitting process, RMT developed estimates of the anticipated rate of discharge from the ground water treatment system (150 gpm) and the chemical characteristics of the treated ground water (see Table 3-2). SC DHEC personnel have provided RMT preliminary discharge limitations for the applicable VOCs. Calculations indicate that the treatment system described by this design report will achieve these permit limitations. RMT awaits issuance of the draft NPDES permit.

Phase two of the NPDES permit process will be completed within two years following start-up of the ground water treatment system. As actual discharge of treated ground water begins, the treated effluent from the system will be sampled and analyzed for the parameters necessary to complete US EPA Form 2C. This permit package, along with the necessary technical documentation, will be submitted for SC DHEC/US EPA review. After submittal of this package,

02511	Aggregate Base Course
02605	Manholes and Cleanouts
02606	Metering Manhole
02615	Pressure Pipe - Schedule 40 and 80 PVC
02620	Jet Pump Systems (ejector, fittings, hose, check valve. pitless adapter)
02641	Valves (ball, globe, check, air release)
02730	Gravity Pipe (PVC)
02921	Topsoil
02931	Seeding
02935	Fertilizing

DIVISION 3
(will be addressed by notes on drawings)

DIVISION 11

11510	Centrifugal Pumps

DIVISION 13

13208	Tanks (fiberglas filament wound)
13235	Air Stripping Tower (tray type) (skid mounted, blower, control panel, level and pressure switches)

DIVISION 15

15260	Pipe Insulation
15489	Vacuum Extraction Equipment (condensate trap, filter, air intake/filter, inlet/outlet silencers, vacuum relief valve, vacuum pump, piping, discharge stack)

DIVISION 16

16111	Conduit
16123	Wire and Cable
16170	Grounding and Bonding
16190	Supporting Devices
16421	Utility Service Entrance
16426	Distribution Switchboards
16476	Enclosed Circuit Breakers
16481	Enclosed Motor Controllers
16855	Heating Cables

3.6.3 Design Calculations

The design calculations applicable for this project are provided in Appendix G. The process control narrative for use in designing the instrumentation and controls for the ground water remediation system are provided for your review in Appendix H. Appendix I contains the Instrumentation Listing for the ground water remediation system.

Section 4

CONSTRUCTION SCHEDULE FOR IMPLEMENTATION OF REMEDY

The following construction schedule is provided for US EPA and SC DHEC review and information only. The time-frames provided in Plate 6 are provided as preliminary guidelines for the use of the reviewer. The Remedial Action Work Plan, scheduled for submission to the Agency following approval of the Final Remedial Design submittal, will contain the final construction schedule that will be enforceable under the provisions of the RD/RA Consent Decree.

U . S . EPA REGION IV

SDMS

Unscannable Material Target Sheet

DocID: 4278 Site ID: SCD980558142

Site Name: Medley Farms Box 6 of 13

Nature of Material:

Map:	✓	Computer Disks:	
Photos:		CD-ROM:	
Blueprints:		Oversized Report:	
Slides:		Log Book:	

Other (describe):

Amount of material: 1 (Remedial Actions Pre-Final Construction Schedule)

Please contact the appropriate Records Center to view the material.

Section 5

CONSTRUCTION COST ESTIMATES

ITEM NO.	ITEM DESCRIPTION	UNITS	UNIT COST($)	QUANTITY	TOTAL($)
1	Mobilization/demobilization	LS	$30,000.00	1	$30,000.00
2	Clearing and Grubbing	AC	$6,200.00	5	$31,000.00
3	Excavation	CY	$10.00	6,300	$63,000.00
4	Revegetation	AC	$2,600.00	5	$13,000.00
5	Road Surface	SY	$5.10	3,400	$17,340.00
6	Manholes, 4 Ft Diameter	EA	$2,875.00	2	$5,750.00
7	Metering Manhole	EA	$7,000.00	1	$7,000.00
8	Rip Rap	SY	$57.50	300	$17,250.00
9	6" Corrugated Polyethylene Tubing	LF	$9.00	265	$2,385.00
10	8" PVC Pipe	LF	$18.00	70	$1,260.00
11	Diffuser	EA	$2,000.00	1	$2,000.00
12	48" Corrugated Metal Pipe	LF	$70.50	90	$6,345.00
13	24" Corrugated Metal Pipe	LF	$26.50	52	$1,378.00
14	Ground Water Recovery Wells	EA	$21,300.00	9	$191,700.00
15	8" Dual Piping (PVC SCH 80)	LF	$45.00	1430	$64,350.00
16	4" Dual Piping (PVC SCH 80)	LF	$20.00	190	$3,800.00
17	2" Dual Piping (pvc SCH 80)	LF	$15.00	660	$9,900.00
18	Well Vaults/valve Pit	Ea	$4,200.00	13	$54,600.00
19	Well Piping/hoses	EA	$6,700.00	11	$73,700.00
20	Trailer-mounted Vacuum Unit	EA	$25,000.00	1	$25,000.00
21	SVE Wells	EA	$9,700.00	6	$58,200.00
22	4" PVC Pipe	LF	$13.00	360	$4,680.00
23	2" PVC Pipe	LF	$10.00	290	$2,900.00
24	SVE Well Vaults	EA	$1,600.00	8	$12,800.00
25	Concrete Pad	EA	$8,100.00	1	$8,100.00
26	Treatment Building	EA	$9,105.00	1	$9,105.00
27	8000 Gal Frp Tank	EA	$8,000.00	1	$8,000.00
28	40 HP Centrifugal Pumps	EA	$7,400.00	2	$14,800.00
29	Air Stripper	EA	$40,000.00	1	$40,000.00
30	Electrical And Instrumentation	LS	$132,000.00	1	$132,000.00
	SUBTOTAL				$911,343.00
	Contingency (20%)				$182,268.60
	TOTAL				$1,093,611.60

Section 6

REFERENCES

Mittwede, Steven K. Geologic Maps of the Pacolet and Pacolet Mills 7.5 Minute Quadrangles. South Carolina Geological Survey Open File Report 64, 1989.

Singley, J.E.; B.A. Beaudet; P.H. Monkey; D.W. DeBerry; J.R. Kidwell; and D.A. Malish. Corrosion Prevention and Control in Water Treatment and Supply Systems. Noyes Publications, Park Ridge, New Jersey, 1985.

Sirrine Environmental Consultants. Final Remedial Investigation Report, Medley Farm Site. Gaffney, S.C., February 1991.

APPENDIX A

MEDLEY FARM CONSENT DECREE REQUIREMENTS

FOR PREFINAL/FINAL DESIGN REPORT

and sketches; (6) specifications in outline form; (7) a plan for satisfying permitting requirements; and (8) preliminary construction schedule.

f. The pre-final/final design submittal shall include, at a minimum, the following: (1) final plans and specifications; (2) a final construction schedule; (3) Operation and Maintenance Plan; (4) Field Sampling Plan (directed at measuring progress towards meeting Performance Standards); and (5) Contingency Plan.

12. Remedial Action.

a. Within 45 days after the approval of the final design submittal, Settling Defendants shall submit to EPA and the State, a work plan for the performance of the Remedial Action at the Site (the "Remedial Action Work Plan"). The Remedial Action Work Plan shall provide for construction of the remedy, in accordance with the SOW, as set forth in the design plans and specifications in the approved final design submittal. Upon its approval by EPA, the Remedial Action Work Plan shall be incorporated into and become enforceable under this Consent Decree. At the same time as they submit the Remedial Action Work Plan, Settling Defendants shall submit to EPA and the State any revisions to the Site Health and Safety Plan for field activities required by the Remedial Action Work Plan.

b. The Remedial Action Work Plan shall include the following: (1) the schedule for completion of the Remedial Action; (2) the method for selection of the contractor; (3) a

APPENDIX B

MEDLEY FARM SOW REQUIREMENTS FOR PREFINAL/FINAL DESIGN REPORT

C. Prefinal/Final Design

The Settling Defendants shall submit the Prefinal Design when the work is approximately 90 percent complete in accordance with the approved design management schedule. The Prefinal Design shall have addressed comments generated from the Preliminary Design Review and clearly show any modification of the design as a result of incorporation of the comments. The Prefinal Design shall function as the draft version of the Final Design. After EPA review and comment on the Prefinal Design, the Final Design shall be submitted. All Final Design documents shall be certified by a Professional Engineer registered in the State of South Carolina. EPA approval of the Final Design is required before initiating the RA, unless specifically authorized by EPA. The following items shall be submitted as part of the Prefinal/Final Design:

1. Complete Design Analyses

The selected design shall be presented along with an analysis supporting the design approach. Design calculations shall be included.

2. Complete Plans and Specifications

A complete set of construction drawings and specifications shall be submitted at the Prefinal stage which describe the selected design. The final submittal shall include a complete set of construction drawings and specifications as well as a set of one-half size reductions of the drawings.

3. Final Construction Schedule

4. Construction Cost Estimate

A construction cost estimate based on sound, routine, generally accepted engineering practice shall be submitted.

APPENDIX C

SC DHEC APPLICATION FOR PERMIT TO CONSTRUCT A WASTEWATER TREATMENT OR COLLECTION SYSTEM

South Carolina DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

Application for Permit to Construct a Wastewater Treatment or Collection System

Bureau of Water Pollution Control

(Please Print or Type)

I. Name of Project: MEDLEY FARM NPL SITE County: CHEROKEE

II. Location (street names, etc.): BURNT GIN ROAD, GAFFNEY, SOUTH CAROLINA ON PROPERTY CURRENTLY OWNED BY MR. RALPH MEDLEY

III. In accordance with the provisions of South Carolina Code Ann. Section 48-1-50 (1976), as amended, I hereby make application, on behalf of the owner whose name appears below, for a permit to construct (describe):

MEDLEY FARM SITE STEERING COMMITTEE (MESSC)

MARY JANE NORVILLE, ESQUIRE - CHAIRPERSON MESSC

IV. Owner's Name, Address, and Telephone Number: C/O KING & SPALDING LAW FIRM
191 PEACHTREE STREET, ATLANTA, GEORGIA 30303 (404) 572-3585

V. Name, Address, and Telephone Number of organization responsible for operation and maintenance (if different from owner): RMT, INC. 100 VERDAE BOULEVARD, GREENVILLE, SC 29606
(803) 281-0030 ATTENTION: STEVE W. WEBB PROJECT MANAGER

VI. Total flow of this project not to exceed: 220,000 GPD or MGD (circle one)

VII. Is this part of a phased project? No ☒ Yes ☐ Phase ____ of ____
Is this project a revision to a previously permitted project? No ☒ Yes ☐
Project name (if different from this project):
DHEC Construction Permit Number: Date Approved:

VIII. Are standard specifications on file with DHEC? No ☒ Yes ☐ Date Approved:
Specifications approved under what name or for whom:
Are standard specifications on file but are not being used on this project? No ☒ Yes ☐

IX. Type of wastewater involved with this project (Please check one):
GROUND WATER REMEDIATION PROJECT
A. Domestic ☐ B. Process (Industrial) ☒ C. Combined (Domestic and Process) ☐

X. Complete Section A (Collection System) and/or B (Wastewater Treatment Plant) and/or C (Effluent/Sludge Disposal only):

A. 1) Name of facility treating the wastewater: MEDLEY FARM NPL SITE
2) NPDES or ND Number of facility in Item #1: SC 0046469

B. 1) Date of the Preliminary Engineering Report (PER) approval: DECEMBER 29, 1992
2) Has an NPDES or ND application been submitted? No ☐ Yes ☒ Date Submitted: NOV. 1992

C. 1) Effluent Disposal Site (Description): JONES CREEK ABOVE THICKETTY CREEK
2) Sludge Disposal Site (Description): NA

XI. Type of Submittal: Complete Section A (Standard) or B (Delegated Review Program - DRP) and check each item submitted:

A. Standard Submittal Package *must* include the following, where applicable:

☐ 1. Application Fee for a sanitary sewer collection system: $250 ☐ $600 (Pretreatment Systems) ☐
☒ 2. A transmittal letter outlining the submittal package.
☒ 3. The original application for permit to construct, properly completed, with two (2) copies.
☒ 4. Three (3) copies of the stamped plans and specifications (omit specifications if you are using approved standard specifications).
☒ 5. Three (3) copies of the appropriate design calculations including flow and pump station calculations, pump curve, etc. The flow calculations should be based on DHEC "Guidelines for Unit Contributory Loadings to Wastewater Treatment Facilities" dated 1990.

☒ 6. Three (3) copies of a detailed 8½" x 11" location map, separate from the plans.
☐ 7. Three (3) copies of construction easements unless the project owner has the right of eminent domain.
☐ 8. One (1) copy of an overall layout of the wastewater system separate from the plans that shows the proposed sewer lines (highlighted for identification) and their sizes and includes existing streets and sewer lines.
☐ 9. A letter of acceptance from the entity providing treatment of the wastewater that includes the specific number of lots and flow being accepted.
☐ 10. A letter from the organization agreeing to be responsible for the operation and maintenance of the proposed sanitary sewer collection system.

Note: Approval will be required from the designated Council of Governments (208 Plan certification), or from DHEC on the non-designated areas, the S.C. Coastal Council (Coastal areas), and the S.C. Water Resources Commission (for pipes crossing streams), before the project will be issued a construction permit.

B. **Delegated Review Program (DRP) Submittal Package *must* include the following to be submitted by the delegated entity:**

☐ 1. Application Fee for a sanitary sewer collection system submitted as a DRP project: $75 ☐
☐ 2. A transmittal letter noting this is a DRP submittal.
☐ 3. The original application for permit to construct, properly completed, with one (1) copy.
☐ 4. Two (2) copies of the stamped plans and specifications (omit specifications if you are using approved standard specifications).
☐ 5. Two (2) copies of the appropriate design calculations including flow and pump station calculations, pump curve, etc. The flow calculations should be based on DHEC "Guidelines for Unit Contributory Loadings to Wastewater Treatment Facilities" dated 1990.
☐ 6. Two (2) copies of a detailed 8½" x 11" location map, separate from the plans.
☐ 7. Two (2) copies of construction easements unless the project owner has the right of eminent domain.
☐ 8. One (1) copy of an overall layout of the wastewater system separate from the plans that shows the proposed sewer lines (highlighted for identification) and their sizes and includes existing streets and sewer lines.
☐ 9. A letter of acceptance from the entity providing treatment of the wastewater that includes the specific number of lots and flow being accepted.
☐ 10. A letter from the organization agreeing to be responsible for the operation and maintenance of the proposed sanitary sewer collection system.
☐ 11. The 208 Plan certification from the appropriate Council of Governments (designated 208 areas), or from DHEC on the non-designated areas.
☐ 12. The S.C. Coastal Council certification (Coastal areas).
☐ 13. A S.C. Water Resources certification for crossings of navigable waterbodies and/or any other related Agency approval letters.
☐ 14. The delegated entity should indicate that a copy of the final approved plans are being returned to the appropriate design engineer.

XII. Copies of the construction plans, the material and construction specifications, the engineering report including supporting design calculations, and the 8½" x 11" detailed location map, are herewith submitted and made a part of this application. I have placed my signature and seal on the engineering documents submitted, signifying that I accept responsibility for the design of this system, and that I have submitted a complete administrative package.

Engineer's Name (Printed): JERRY L. MC GRANER Signature: _____

S.C. Registration No.: 12,474

XIII. Prior to final approval, I will submit a statement certifying that construction is complete and in accordance with approved plans and specifications, to the best of my knowledge, information and belief. This certification will be based upon periodic observations of construction and a final inspection for design compliance by me or a representative of this office who is under my supervision.

Engineer's Name (Printed): JERRY L. MC GRANER Signature: _____

S.C. Registration No.: 12,474

XIV. I have read this application and agree to the requirements and conditions that are contained in it. Also, I agree to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection.

Owner's Name (Printed): MARY JANE NORVILLE, ESQUIRE Signature: _____

Owner's Title: CHAIRPERSON - MEDLEY FARM SITE Date: _____

STEERING COMMITTEE

****** See Attached Sheet for Instructions on Completing this Application ******

☒ 6. Three (3) copies of a detailed 8½" x 11" location map, separate from the plans.
☐ 7. Three (3) copies of construction easements unless the project owner has the right of eminent domain.
☐ 8. One (1) copy of an overall layout of the wastewater system separate from the plans that shows the proposed sewer lines (highlighted for identification) and their sizes and includes existing streets and sewer lines.
☐ 9. A letter of acceptance from the entity providing treatment of the wastewater that includes the specific number of lots and flow being accepted.
☐ 10. A letter from the organization agreeing to be responsible for the operation and maintenance of the proposed sanitary sewer collection system.

Note: Approval will be required from the designated Council of Governments (208 Plan certification), or from DHEC on the non-designated areas, the S.C. Coastal Council (Coastal areas), and the S.C. Water Resources Commission (for pipes crossing streams), before the project will be issued a construction permit.

B. Delegated Review Program (DRP) Submittal Package must include the following to be submitted by the delegated entity:

☐ 1. Application Fee for a sanitary sewer collection system submitted as a DRP project: $75 ☐
☐ 2. A transmittal letter noting this is a DRP submittal.
☐ 3. The original application for permit to construct, properly completed, with one (1) copy.
☐ 4. Two (2) copies of the stamped plans and specifications (omit specifications if you are using approved standard specifications).
☐ 5. Two (2) copies of the appropriate design calculations including flow and pump station calculations, pump curve, etc. The flow calculations should be based on DHEC "Guidelines for Unit Contributory Loadings to Wastewater Treatment Facilities" dated 1990.
☐ 6. Two (2) copies of a detailed 8½" x 11" location map, separate from the plans.
☐ 7. Two (2) copies of construction easements unless the project owner has the right of eminent domain.
☐ 8. One (1) copy of an overall layout of the wastewater system separate from the plans that shows the proposed sewer lines (highlighted for identification) and their sizes and includes existing streets and sewer lines.
☐ 9. A letter of acceptance from the entity providing treatment of the wastewater that includes the specific number of lots and flow being accepted.
☐ 10. A letter from the organization agreeing to be responsible for the operation and maintenance of the proposed sanitary sewer collection system.
☐ 11. The 208 Plan certification from the appropriate Council of Governments (designated 208 areas), or from DHEC on the non-designated areas.
☐ 12. The S.C. Coastal Council certification (Coastal areas).
☐ 13. A S.C. Water Resources certification for crossings of navigable waterbodies and/or any other related Agency approval letters.
☐ 14. The delegated entity should indicate that a copy of the final approved plans are being returned to the appropriate design engineer.

XII. Copies of the construction plans, the material and construction specifications, the engineering report including supporting design calculations, and the 8½" x 11" detailed location map, are herewith submitted and made a part of this application. I have placed my signature and seal on the engineering documents submitted, signifying that I accept responsibility for the design of this system, and that I have submitted a complete administrative package.

Engineer's Name (Printed): JERRY L. MC GRANER Signature: _____

S.C. Registration No.: 12,474

XIII. Prior to final approval, I will submit a statement certifying that construction is complete and in accordance with approved plans and specifications, to the best of my knowledge, information and belief. This certification will be based upon periodic observations of construction and a final inspection for design compliance by me or a representative of this office who is under my supervision.

Engineer's Name (Printed): JERRY L. MC GRANER Signature: _____

S.C. Registration No.: 12,474

XIV. I have read this application and agree to the requirements and conditions that are contained in it. Also, I agree to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection.

Owner's Name (Printed): MARY JANE NORVILLE, ESQUIRE Signature: Mary Jane Norville

Owner's Title: CHAIRPERSON - MEDLEY FARM SITE STEERING COMMITTEE Date: May 26, 1993

****** See Attached Sheet for Instructions on Completing this Application ******

DHEC 1970 (8/92)

APPENDIX D

DRAFT NPDES PERMIT NO. SC0046469

FOR MEDLEY FARM NPL SITE

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

May 13, 1993

Ms. Mary Jane Norville, Esq.
Chair - Medley Farm Site Steering Committee
King & Spalding Law Firm
191 Peachtree Street
Atlanta, GA 30303-1763

RE: NPDES Permit No. SC0046469
Medley Farms NPL Site
Cherokee County

Dear Ms. Norville:

The South Carolina Department of Health and Environmental Control intends to issue a National Pollutant Discharge Elimination System (NPDES) permit to the above-referenced facility in the near future.

The enclosed draft permit shows the proposed conditions to be incorporated as part of the NPDES permit. In order that you understand your responsibilities included in the provisions of this permit, particular attention should be given to the following sections:

1. Part I.A.: This section(s) contains listings of effluent characteristics, discharge limitations, and monitoring requirements. The effective dates for various requirements are listed.

2. Part I.B.: This section contains the schedule of compliance applicable to your facility. If your facility is presently in compliance, no schedule is included. If you have a schedule of compliance, please note Part I.B.2. which contains your responsibilities for reporting compliance requirements.

3. Part I.C.2.: This section contains your responsibilities for reporting monitoring results.

Whether you have specific objections to the draft permit or are satisfied with its conditions, your comments are needed in writing to this office within 30 days. If you have any questions concerning the enclosed conditions or the procedures associated with the permit program, please contact me at the above address or call me at (803) 734-4733.

Sincerely,

Francile S. Shelley
Environmental Engineer Associate
Industrial & Agricultural Wastewater Division

FSS/pww

Enclosures

cc: Barney Harmon, Appalachia III EQC
SC Appalachian Council of Government
Steve W. Webb, P.E., RMT
Water Quality Monitoring
Robert Wooten, USEPA
Richard Haynes, BSHWM
Billy Britton, BSHWM

South Carolina

DHEC

Department of Health and Environmental Control

Water Pollution Control PERMIT

TO DISCHARGE WASTEWATER IN ACCORDANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

THIS CERTIFIES THAT

Medley Farms NPL Site

has been granted permission to discharge wastewater from a facility located at

Gaffney, Cherokee County
South Carolina

to receiving waters named

Jones Creek

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976) and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."

Marion F. Sadler, Jr.
DIRECTOR, DIVISION OF INDUSTRIAL & AGRICULTURAL WASTEWATER
BUREAU OF WATER POLLUTION CONTROL

Issued:

Expires:

Effective:

Permit No.: SC0046469

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from outfall(s) serial number 001: treated groundwater.

Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
	Monthly Average	Daily Max.	Monthly Average	Daily Max.	Measurement Frequency	Sample Type
Flow-m3/day (MGD)	-	-	MR	MR	Continuous	Recording flow meter
1,2-Dichloroethane	-	-	MR	0.028 mg/l	Weekly	Grab
1,1-Dichloroethene	-	-	MR	0.039 mg/l	Weekly	Grab
Tetrachloroethene	-	-	MR	0.072 mg/l	Weekly	Grab
Trichloroethene	-	-	MR	0.028 mg/l	Weekly	Grab
BOD_5	-	-	10 mg/l	20 mg/l	2/Month	Grab

MR = Monitor and Report Results.

2. The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored twice per week by grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts; nor, shall the effluent cause a visible sheen on the receiving waters.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): following treatment but prior to mixing with other waste streams on the receiving water.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

5. During the period beginning on the effective date of this permit and lasting through (See Part III, Special Condition #10) the Permittee is authorized to discharge from outfall serial number 001: treated groundwater.

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS (lbs/day)		Other Units (Specify)		MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
* Biological Monitoring (Whole Effluent Chronic Toxicity Testing)	-	-	-	MR	1/month	Grab

* at IWC of 72 % (See Part III, Special Condition # 10)

6. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at or near the outfall, but prior to mixing with the receiving stream.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

11. During the period beginning (See Part III, Special Condition #10) and lasting through the expiration date the Permittee is authorized to discharge from outfall serial number 001: treated groundwater.

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS (lbs/day)		Other Units (Specify)		MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Biological Monitoring (Whole Effluent Chronic Toxicity Testing)	-	-	-	0[1]	1/month[1]	Grab

(1) See Part III, Condition #10. a,b,d,e

12. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at or near the outfall, but prior to mixing with the receiving stream.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedules:

N/A

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

C. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be present and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to ensure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10% from the true discharge rates throughout the range of expected discharge volumes. The primary flow device must be accessible to the use of a continuous flow recorder. Where a flume is present, a separate stilling well for Department/EPA use must be provided if required by the Department.

Design Considerations

3. Reporting Monitoring Results

Monitoring results obtained each month shall be reported monthly on a Discharge Monitoring Report Form (EPA Form 3320-1). The first report is due postmarked no later than the 28th day of the month following the month this permit becomes effective. Two copies of these, and all other reports required herein, shall be submitted to the Department:

S.C. Department of Health and Environmental Control
ATTN: BWPC/Enforcement Section
2600 Bull Street
Columbia, South Carolina 29201

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to State Environmental Laboratory Certification Regulation 61-81 and Section 304(h) of the Act, as amended. (Federal Register, October 16, 1973; Title 40, Chapter I, Sub-chapter D, Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants." Amended by Federal Register, December 1, 1976, and any other amendments that may be promulgated).

5. **Recording of Results**

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. the exact place, date and time of sampling:

b. the dates and times the analyses were performed;

c. the person(s) who performed the analyses and the laboratory certification number where applicable;

d. the analytical techniques or methods used; and

e. the results of all required analyses.

6. **Additional Monitoring by Permittee**

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified herein, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA-3320-1). Such increased frequency shall also be indicated. Additional or accelerated monitoring may be required to determine the nature and impact of a non-complying discharge on the environment or to determine if a single non-complying sample is representative of the long term condition (monthly average).

7. **Records Retention**

All records and information resulting from the monitoring activities required by this permit including all records of analysis performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Department. The permittee shall furnish to the Department, upon request, copies of records required to be kept by this permit.

8. **Definitions**

a. The "monthly average", other than for fecal coliform, is the arithmetic mean of all samples collected in a calendar month period. The monthly average for fecal coliform bacteria is the geometric mean of all samples collected in a calendar month period. The monthly average loading is the arithmetic average of all individual loading determinations made during the month.

b. The "weekly average", other than for fecal coliform, is the arithmetic mean of all the samples collected during a one-week period. For self-monitoring purposes, weekly periods in a calendar month are defined as three consecutive seven day intervals starting with the first day of the calendar month and a fourth interval containing seven days plus those days beyond the 28th day in a calendar month. The value to be reported is the single highest of the four weekly averages computed during a calendar month. The weekly average loading is the arithmetic average of all individual loading determinations made during the week.

c. The "daily maximum" is the highest average value recorded of any sample collected during the calendar month.

d. The "instantaneous maximum or minimum" is the highest or lowest value recorded of any sample collected during the calendar month.

e. Arithmetic Mean: The arithmetic mean of any set of values is the summation of the individual values divided by the number of individual values.

f. Geometric Mean: The geometric mean of any set of values is the Nth root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

g. Department: The South Carolina Department of Health and Environmental Control.

h. Act: The Clean Water Act (Formerly referred to as the Federal Water Pollution Control Act) Public Law 92-500, as amended.

i. Grab Sample: An individual discrete or single influent or effluent portion of at least 100 milliliters collected at a time representative of the discharge and over a period not exceeding 15 minutes and retained separately for analysis. Instantaneous flow measured at the time of grab sample collection shall be used to calculate quantity.

j. Composite Sample: One of the following four types of composite samples as defined is specified within this permit:

(1) An influent or effluent portion collected continuously over a specified period of time at a rate proportional to the flow.

(2) A combination of not less than 8 influent or effluent grab samples collected at regular (equal) intervals over a specified period of time, properly preserved, (See part I.C.4.) and composited by increasing the volume of each aliquot in proportion to flow. If continuous flow measurement is not used to composite in proportion to flow, the following method will be used: Take an instantaneous flow measurement each time a grab sample is collected. At the end of the sampling period, sum the instantaneous flow measurements to obtain a total flow to determine the partial amount (percentage) of each grab sample to be combined to obtain the composite sample.

(3) A combination of not less than 8 influent or effluent grab samples of equal volume but at variable time intervals that are inversely proportional to the volume of the flow. That is, the time interval between aliquots is reduced as the volume of flow increases.

(4) A combination of not less than 8 influent or effluent grab samples of constant (equal) volume collected at regular (equal) time intervals over a specified period of time, while being properly preserved.

Continuous flow or the sum of instantaneous flows measured and averaged for the specified compositing time period shall be used with composite sample results to calculate quantity.

9. **Right of Entry**

The permittee shall allow the Commissioner of the Department of Health and Environmental Control, the Regional Administrator of EPA, and/or their authorized representatives:

a. To enter upon the permittee's premises where a regulated facility or activity and effluent source is located in which any records are required to be kept under the terms and conditions of this permit, and,

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit and sample or monitor any substances or parameters at any location of the purposes of assuring permit compliance.

A. GENERAL REQUIREMENTS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit non-compliance constitutes a violation of the Act and the S.C. Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for the denial of a permit renewal application.

2. Civil and Criminal Liability

a. Any person who violates a term, condition or schedule of compliance contained within this permit is subject to the actions defined by Sections 48-1-320 and 48-1-330 of the S.C. Pollution Control Act.

b. Except as provided in permit conditions on "Bypassing" (Part II.C.2.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for non-compliance.

c. It shall not be an acceptable defense of the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

d. It is the responsibility of the permittee to have a treatment facility that will meet the final effluent limitations of this permit. The approval of plans and specifications by the Department does not relieve the permittee of responsibility for compliance.

3. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 of the Act, the S.C. Pollution Control Act or applicable provisions of the S.C. Hazardous Waste Management Act and the S.C. Oil and Gas Act.

4. Permit Modification

a. The permittee shall furnish to the Department within a reasonable time any relevant information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit, or to determine compliance with the permit.

b. Upon sufficient cause, this permit may be modified, revoked, reissued, or terminated during its term, after public notice and opportunity for a hearing. Modifications deemed to be minor will not require public notice.

c. The filing of a request by the permittee for a permit modification, or a notification of planned changes or anticipated non-compliance, does not stay any permit condition.

5. **Toxic Pollutants**

Notwithstanding Part II.A.4. above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitations for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and permittee so notified.

6. **State Laws**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

7. **Property Rights**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

8. **Severability**

The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

9. **Onshore and Offshore Construction**

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

B. REPORTING REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any planned facility expansions, production increases, or process modifications which will result in a new or different discharge of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the Department of such changes. Following such notice, the permit may be modified to specify and limit any pollutant not previously limited.

2. Twenty-Four Hour Non-Compliance Reporting

a. The permittee shall report any non-compliance with provisions specified in this permit which may endanger public health or the environment. The permittee shall notify the Department orally within 24 hours of becoming aware of such conditions. During normal working hours call 803/734-5300. After hour reporting should be made to the 24 hour Emergency Response telephone number 803/253-6488. The permittee shall provide the following information to the Department in writing, within five (5) days of becoming aware of such conditions:

   1. A description of the discharge and cause of non-compliance; and,

   2. The period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the non-complying discharge.

b. The following violations shall be included in a 24 hour report when they might endanger health or the environment:

   1. An unanticipated bypass which exceeds any effluent limitation in this permit;

   2. Any upset which exceeds any effluent limitation in the permit.

c. As soon as the permittee has knowledge of or anticipates the need for a bypass, but not later than 10 days before the date of the bypass, it shall notify the Department and provide a determination of the need for bypass as well as the anticipated quality, quantity, time of duration, and effect of the bypass.

3. **Other Non-Compliance**

The permittee shall report in narrative form, all instances of non-compliance not previously reported under Section B, Paragraph B.2., at the time Discharge Monitoring Reports are submitted. The reports shall contain the information listed in Paragraph B.2.a.

4. **Transfer of Ownership or Control**

A permit may be transferred to another party under the following conditions:

a. The permittee notifies the Department of the proposed transfer at least thirty (30) days in advance of the proposed transfer date;

b. A written agreement is submitted to the Department between the existing and new permittee containing a specific date for the transfer of permit responsibility, coverage, and liability for violations up to that date and thereafter.

Transfers are not effective if, within 30 days of receipt of proposal, the Department disagrees and notifies the current permittee and the new permittee of the intent to modify, revoke and reissue, or terminate the permit and to require that a new application be filed.

5. **Expiration of Permit**

The permittee is not authorized to discharge after the expiration date of this permit, unless a completed application for reissuance is submitted no later than 180 days prior to the expiration date. Permission may be granted to submit an application later than this, but not later than the expiration date of the permit. In accordance with Section 1-23-370 of the code of laws of South Carolina, if a timely and sufficient application is made for any activity of a continuing nature, the existing permit does not expire until a final determination is made to renew or deny renewal of the existing permit.

6. **Signatory Requirements**

All applications, reports or information submitted to the Department shall be signed and certified.

a. All permit applications shall be signed as follows:

1. For a corporation: by a principal executive officer of at least the level of vice-president or by a duly authorized representative;

2. For a partnership or sole proprietorship: by a general partner or proprietor, respectively; or,

3. For a municipality, State, Federal or other public agency: by either a principal executive officer or ranking elected official.

b. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by duly authorized representation only if:

1. The authorization is made in writing by a person described above and submitted to the Department;

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

7. **Availability of Reports**

Except for data determined to be confidential under Section 48-1-270 of the S.C. Pollution Control Act, all reports prepared in accordance with the terms and conditions of this permit shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 48-1-340 of the S.C. Pollution Control Act.

8. **Changes in Discharges of Toxic Pollutants or Hazardous Substances**

a. The permittee shall notify the Department as soon as it knows or has reason to believe that any activity has occurred or will occur which would result in the discharge in any outfall of:

1. Any toxic pollutant(s) identified under Section 307(a) of the Act which exceed the highest of the following concentrations and are not limited in the permit.

- 1 mg/l for antimony (Sb):
- 0.500 mg/l for 2,4-dinitrophenol or 2-methyl, -4,6-dinitrophenol;
- 0.200 mg/l for acrolein or acrylonitrile;
- 0.100 mg/l for any other toxic pollutant; or,
- Ten (10) times the maximum concentration value reported in the permit application.

2. Any hazardous substance(s) identified under Section 311 of the Act as determined by Federal Regulation 40 CFR 117.

b. The permittee must notify the Department as soon as it knows or has reason to believe that it has begun or expects to begin to use or manufacture as an intermediate or final product or by-product any toxic pollutant or hazardous substance which was not reported in the permit application.

C. OPERATION AND MAINTENANCE

1. Facilities Operation

a. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance based on design facility removals, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls as determined by the laboratory certification program of the Department. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit. Maintenance of facilities, which necessitates unavoidable interruption of operation and degradation of effluent quality shall be scheduled during non-critical water quality periods and carried out in a manner approved by the Department.

b. The permittee shall provide for an operator, as certified by the South Carolina Board of Certification for Environmental Systems Operators, with a grade equal to or higher than the classification designated in Part III.A.3. The name and grade of the operator of record shall be submitted to the Department prior to placing the facility into operation. A roster of operators associated with the facility's operation and their certification grades shall also be submitted with the name of the "operator-in-charge". Any changes in operator or operators shall be submitted to the Department as they occur.

2. Bypassing

Any intentional diversion from or bypass of waste streams from any portion of wastewater collection and treatment facilities which is not a designed or established operating mode for the facility is prohibited except (a) where unavoidable to prevent loss of life, personal injury or severe property damage, or (b) where excessive storm drainage or run-off would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit and there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities or retention of untreated wastes. "Severe property damage" does not mean economic loss caused by delays in production.

3. **Duty to Mitigate, Halt or Reduce Activity**

The permittee shall take all reasonable steps to prevent, minimize or correct any adverse impact on public health or the environment, resulting from non-compliance with this permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with this permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided.

4. **Power Failures**

In order to maintain compliance with effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I.B., provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I.B., have a plan of operation which will:

b. Halt, reduce, or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

5. **Removed Substances**

Solids, sludges, filter backwash or other residuals removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent such materials from entering State waters and in accordance with guidelines issued pursuant to Section 405 of the Act, and the terms of a construction or NPDES and/or solid or hazardous waste permit issued by the Department.

PART III

A. OTHER REQUIREMENTS

1. The permittee shall maintain at the permitted facility a complete Operations and Maintenance Manual for the waste treatment plant. The manual shall be made available for on-site review during normal working hours. The manual shall contain operation and maintenance instructions for all equipment and appurtenances associated with the waste treatment plant. The manual shall contain a general description of the treatment process(es), operating characteristics that will produce maximum treatment efficiency and corrective action to be taken should operating difficulties be encountered.

2. The permittee shall provide for the performance of routine daily treatment plant inspections by a certified operator of the appropriate grade as defined in Part II.C.1. The inspection shall include, but is not limited to, areas which require a visual observation to determine efficient operations and for which immediate corrective measures can be taken using the O & M manual as a guide. All inspections shall be recorded and shall include the date, time and name of the person making the inspection, corrective measures taken, and routine equipment maintenance, repair, or replacement performed. The permittee shall maintain all records of inspections at the permitted facility as required by Part I.C.7., and the records shall be made available for on-site review during normal working hours.

3. The wastewater treatment plant shall be assigned a classification in the Permit to Construct to be issued by the Department. Treatment systems must be completed and installed prior to beginning of discharge.

4. The permittee shall maintain an all weather access road to the wastewater treatment plant and appurtenances at all times.

5. The permittee shall monitor all parameters consistent with conditions established by this permit on the 2nd Monday of every calendar month, unless otherwise approved by this Department. Additional monitoring, as necessary to meet the frequency requirements of this permit (Part I.A. Effluent Limitations and Monitoring Requirements) shall be performed by the permittee.

6. The permittee shall maintain at the permitted facility a record of the method(s) used in "estimating" the discharge flow (i.e., pump curves, production charts, water use records, etc.). Records of any necessary calibrations must also be kept. This information shall be made available for on-site review by Department personnel during normal working hours.

7. Disposal of all sludge and waste oils shall meet all requirements of SCDHEC's Bureau of Solid and Hazardous Waste Management.

8. The NPDES permit limitations are considered <u>provisional</u> until the appropriate basin-wide NPDES permitting activity has been completed. These limits are subject to change at that time.

9. The application for a Permit to Construct shall include plans and specification for an in-stream diffuser for the discharge of the effluent to Jones Creek. Such diffuser must be installed and ready for use prior to initiation of any discharge.

10. (a) On a monthly basis, a three-brood chronic toxicity test shall be conducted using a control and the instream waste concentration (IWC) of 72 %. The test shall be conducted using Ceriodaphnia dubia as the test organism and in accordance with the most recent "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" (EPA/600/5-89/01) and "South Carolina Procedures for Pass/Fail Modifications of the Ceriodaphnia 48 hour Acute Toxicity Test and Ceriodaphnia Survival and Reproduction Test" (SCDHEC, May 1989). The raw data and results shall be submitted in accordance with Part I.(C)(3) of the permit for each monthly test. The test must be performed by a DHEC certified laboratory.

(b) If the test results indicate a significant difference in Ceriodaphnia dubia survival and/or reproduction between the control and instream waste concentration at the 95% confidence level (p=0.05), the test shall be deemed a failure.

(c) If a test fails, a toxicity evaluation plan shall be submitted to the Enforcement Section of the Bureau of Water Pollution Control within sixty (60) days of notification to the Department of test results.

(d) The permittee must indicate on the discharge monitoring report form whether the test passes or fails. If the test fails, the number "1" shall be placed on the form; if the test passes, the number "0" shall be placed on the form.

(e) Twelve consecutive acceptable months of toxicity testing results may result in quarterly testing in lieu of monthly tests at the Department's discretion.

11. After twelve consecutive months of "passed" toxicity testing results, the Department may terminate the screening process and impose a limitation. Page 4 of this permit shall become effective and Page 3 shall expire on the first day of the month after the Department informs the permittee in writing.

12. A 2C NPDES Application Form shall be completed and submitted to SC DHEC within 120 days of the initial discharge of treated groundwater. The permittee shall analyze for all parameters in Item V. , Parts A, B, and C.. Significant variation from anticipated levels of pollutants present may result in this permit being modified or revoked and reissued to incorporate additional parameters and limitations.

Rationale/FSS
NPDES Permit No. SC0046469
Medley Farms Site

I. General Information

The wastewater from this project will be generated from the clean-up of contaminated groundwater from the Medley Farm Site in Cherokee County. The design of the remediation system is based on a maximum flow rate of 152.77 gpm (0.22 MGD). This treated water will be piped to Jones Creek for discharge. Jones Creek will be considered a FW (Freshwater) Class Stream.

Determination of Limitations

7Q10 of Jones Creek = 0.13 cfs (0.084 MGD)
Q_A of Jones Creek = 1.6 cfs (1.034 MGD)
Q_D (Effluent Discharge Flow) = 0.22 MGD
Dilution Factor for Aquatic Life (DF_1) =

$$\frac{7Q10 + Q_D}{Q_D} = \frac{0.084 + 0.22}{0.22} = 1.38$$

Dilution Factor for MCLs and Human Health (DF_2) =

$$\frac{Q_A + Q_D}{Q_D} = \frac{1.034 + 0.22}{0.22} = 5.7$$

Instream Waste Concentration for Aquatic Life (IWC_1) =
$1/DF_1 \times 100\ \% = 72.37\ \%$

Instream Waste Concentration for MCLs and Human Health (IWC_2) = $1/DF_2 \times 100\ \% = 12.22\%$

Allowable Discharge Concentration = Acceptable Instream Concentration x Dilution Factor

Discharge limitations are considered for those regulated pollutants found to be present in the groundwater. Limitations are based on EPA Water Quality Criteria for Aquatic Life (WQC) and Human Health (HH) consideration, whichever are more stringent. Where applicable, Drinking Water Maximum Contaminant Levels (MCLs) are used. In any instance where the State's lower limit of detection is below the limits, the applicable limitation will be stated as "less than (<)" the detection limit.

II. Permit Limitations :

A. Benzene
1. Sampling Results: 2.0 ug/l
2. Drinking Water MCLs: 5 ug/l
3. WQC (Aquatic Life): (5,300 ug/l + 100) x DF_1(1.38) = 73.14 ug/l
4. WQC (Human Health): 5 ug/l x DF_2(5.7) = 28.5 ug/l
5. State Lower Limit of Detection: 2.0 ug/l
6. Conclusion: Due to effluent concentrations resulting in less than one-tenth the most stringent stream standards, there will be no limit for Benzene.

B. Chloroform
1. Sampling Results: 9 ug/l
2. Drinking Water MCLs: 100 ug/l
3. WQC (Aquatic Life): (1240 + 10) x DF_1(1.38) = 171.12 ug/l
4. WQC (Human Health): 100 ug/l x DF_2(5.7) = 570.0 ug/l
5. State Lower Limit of Detection: 2.0 ug/l
6. Conclusion: Due to effluent concentrations resulting in less than one-tenth the most stringent stream standards, there will be no limit for Chloroform.

C. 1,1-Dichloroethane
1. Sampling Results: 5 ug/l
2. Drinking Water MCLs: none
3. WQC (Aquatic Life): none
4. WQC (Human Health): none
5. State Lower Limit of Detection: 2.0 ug/l
6. Conclusion: In the absence of any State standards, and the low concentrations present, there will be no limit for 1,1- Dichloroethane.

D. 1,2-Dichloroethane
1. Sampling Results: 650 ug/l
2. Drinking Water MCLs: 5 ug/l
3. WQC (Aquatic Life):(118,000÷ 100) x DF_1(1.38) = 1628.4 ug/l
4. WQC (Human Health): 5 ug/l x DF_2(5.7) = 28.5 ug/l
5. State Lower Limit of Detection: 5 ug/l
6. Conclusion: The limit for 1,2-Dichloroethane will be 28.5 ug/l, based on Water Quality Standards (Drinking Water MCL)

E. 1,1-Dichloroethene
1. Sampling Results: 400 ug/l
2. Drinking Water MCLs: 7 ug/l
3. WQC (Aquatic Life):(11,600÷ 100) x DF_1(1.38) = 160.08 ug/l
4. WQC (Human Health): 7 ug/l x DF_2(5.7) = 39.9 ug/l
5. State Lower Limit of Detection: 5 ug/l
6. Conclusion: The limit for 1,1-Dichloroethene will be 39.9 ug/l, based on Water Quality Standards (Drinking Water MCL)

F. 1,2-trans-Dichloroethane
1. Sampling Results: 37 ug/l
2. Drinking Water MCLs: none
3. WQC (Aquatic Life): none
4. WQC (Human Health): none
5. State Lower Limit of Detection:
6. Conclusion: In the absence of any state standard and the low concentrations present, there will be no limit for 1,2-Dichloroethane.

G. Tetrachloroethene
1. Sampling Results: 560 ug/l
2. Drinking Water MCLs: 88.5 ug/l
3. WQC (Aquatic Life):(5,280÷ 100) x DF_1(1.38) = 72.86 ug/l
4. WQC (Human Health): 88.5 x DF_2(5.7) = 504.45 ug/l
5. State Lower Limit of Detection: 2 ug/l
6. Conclusion: The limit for Tetrachloroethene will be 72.8 ug/l based on Water Quality Criteria (Aquatic Life)

H. 1,1,1-Trichloroethane
1. Sampling Results: 61 ug/l
2. Drinking Water MCLs: 200 ug/l
3. WQC (Aquatic Life): none
4. WQC (Human Health): 200 ug/l x DF_2(5.7) = 1,140 ug/l
5. State Lower Limit of Detection: 2 ug/l
6. Conclusion: Due to effluent concentrations resulting in less than one-tenth the most stringent stream standards, there will be no limit for 1,1,1-Trichloroethane.

I. Trichloroethene (TCE)
1. Sampling Results: 920 ug/l
2. Drinking Water MCLs: 5 ug/l
3. WQC (Aquatic Life):(45,000 + 100) x DF_1(1.38) = 621.0 ug/l
4. WQC (Human Health): 5 ug/l x DF_2(5.7) = 28.5 ug/l
5. State Lower Limit of Detection: 2 ug/l
6. Conclusion: The limit for Trichloroethene will be 28 ug/l based on Water Quality Criteria (Drinking Water MCL)

J. BOD_5
1. Sampling Results: <10 mg/l
Wasteload Allocation Section recommendations:
Daily Maximum: 20 mg/l
Monthly Average: 10 mg/l
2. Conclusion: Based on water quality considerations, BOD will be limited to 10 mg/l as monthly average and 20 mg/l as daily maximum.

K. pH
Regulation 61-68, Water Classifications and Standards, sets pH standard for Freshwaters between 6.0 and 8.5

SUMMARY OF LIMITS

Pollutant	Proposed Limitation
1,2-Dichloroethane	28.5 ug/l (0.028 mg/l)
1,1- Dichloroethene	39.9 ug/l (0.039 mg/l)
Tetrachloroethene	72.8 ug/l (0.072 mg/l)
Trichloroethene	28.5 ug/l (0.028 mg/l)
BOD_5	10 mg/l (Monthly Average)
	20 mg/l (Daily Maximum)
pH	6.0 to 8.5

L. The Department's Toxic Control Strategy for Wastewater Discharges requires only chronic toxicity testing for IWC's between 10% and 80% when an instream diffuser instream diffuser is in place. Since the special conditions section of the permit calls for an instream diffuser to be installed, only chronic toxicity testing is being required.

If no failures occur during the year's screening process, a limitation for biological monitoring may be imposed and the frequency of testing may be reduced to once per quarter.

APPENDIX E
SC DHEC AIR QUALITY EMISSIONS WAIVER, DATED DECEMBER 29, 1992

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

December 29, 1992

Mr. David Robb, Project Engineer
RMT, Inc.
P.O. Box 16778
Greenville, SC 29606

Dear Mr. Robb:

The Bureau of Air Quality Control has reviewed the emission information for the proposed Air Stripper and Soil Vapor Extraction System to be located at Medley Farm NPL Site in Gaffney, S.C. Air Dispersion Modeling results indicate that the air toxic emitted (1,1 Dichloroethene) will not result in off-site air concentrations exceeding our Air Toxic Standards (Standard No. 8). Furthermore, since the potential emissions do not exceed 1000 lbs/month, an Air Permit will not be required for the Air Stripper and Soil Vapor Extraction System. This is in accordance with Section I, Part B of Regulation No. 62.5, Standard No. 8.

Sincerely,

Rhonda H. Banks, Permit Engineer
Engineering Services Division
Bureau of Air Quality Control

cc: Ronald Garrett, Appalachia III District
Richard Haynes, SC DHEC

AIR DISPERSION MODELLING SUMMARY SHEET

PROJECT NAME: Medley Farm NPL Site **DATE:** 22 December 1992

LOCATION : Gaffney **REVIEWED BY:** KJC

PERMIT NO. :

MODEL USED : Screen

MODELLED FOR: _____ NAAQS COMPLIANCE _____ PSD INCREMENT
___X___ AIR TOXIC

SOURCES MODELLED: Air Stripper

MODELLING DESCRIPTION:

RESULTS:

POLLUTANT	AVG. TIME	MAX. MODELLED CONCENTRATION ug/m^3	BACKGROUND CONCENTRATION ug/m^3	TOTAL ug/m^3	STANDARD ug/m^3
1,1 Dichloroethene (CAS #75354)					
	24 Hour	1.0	N/A	1.0	99

APPENDIX F
PROJECT SPECIFICATIONS -
DIVISION 1 THROUGH 16

REVISION: B PREPARED BY: DS
REV. DATE: 5-27-93 APPROVED BY:
RELEASE FOR: EPA Review

MEDLEY FARMS NPL SITE
REMEDIATION DESIGN

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of Work

B. Contractor use of site and premises.

C. Future work.

D. Work Sequence.

E. Owner occupancy.

1.2 DESCRIPTION OF WORK

A. Grade the site and construct access roads to the location of the proposed wells and equipment pads.

B. Drill and install vapor extraction wells and ground water extraction wells at the locations shown.

C. Install the vacuum extraction equipment and piping and the ground water treatment equipment and piping as well as the discharge piping to the diffuser at Jones creek.

1.3 CONTRACTOR USE OF SITE AND PREMISES

A. Limit use of site and premises to allow:

1. Land Owner occupancy.

2. Access Areas designated on the drawings.

B. Construction Operations: Limited to areas noted on Drawings.

C. Time Restrictions for Performing Work: 7 AM to 7 PM Unless permitted by the Resident Project Representative.

1.4 FUTURE WORK

A. Provide for future installation of 'System C' in the jet pump system.

1.5 WORK SEQUENCE

A. Construct Work in phases during the construction period, coordinate construction schedule and operations with Engineer:

1. Phase 1: Site Work on roads.
2. Phase 2: Well Installations.
3. Phase 3: Piping and Equipment installation.

1.6 LAND OWNER OCCUPANCY

A. The Land Owner intends to occupy the residence on the site.

B. Cooperate with Land Owner to minimize conflict, and to facilitate Land Owner's operations.

C. Schedule the Work to accommodate this requirement.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Surveying and Field Engineering services.

B. Engineer will identify control points.

1.02 RELATED REQUIREMENTS

A. Section 01010 - Administrative Provisions

B. Section 01700 - Contract Closeout: Record Documents.

1.03 QUALITY CONTROL

A. Use skilled persons, trained and experienced in the necessary tasks and techniques, for the proper performance of this work.

B. Verify locations of survey control points prior to starting work. Promptly notify Engineer of any discrepancies discovered.

1.04 SUBMITTALS

A. On request, submit data demonstrating qualifications of persons providing services.

B. On request, submit documentation verifying accuracy of survey work.

C. Maintain complete, accurate log of control and survey work as it progresses. Submit Record Documents under provisions of Section 01700.

1.05 CONTRACTOR SURVEY REQUIREMENTS

A. Establish and maintain lines and levels.

B. Locate and lay out Work by instrumentation and similar appropriate means.

C. Periodically verify layouts.

1.06 PROTECTION

A. Locate and protect control points before starting Work.

B. Preserve permanent reference points during progress of Work.

C. Do not change or relocate reference points or lines without specific approval from ENGINEER.

D. Promptly inform ENGINEER when a reference point is lost or destroyed, or requires relocation.

END OF SECTION

SECTION 01105

MONITORING WELL PROTECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Protection of monitoring wells.

B. Grade adjustment of wells.

C. Repair of damage to wells.

1.02 PROTECTION

A. Preserve and protect from damage existing monitoring wells.

B. Protect well casing and boring from infiltration of surface water, other water, soil, and any foreign materials.

C. Use hand equipment when excavating, filling, or conducting other operations around monitoring wells.

D. Notify ENGINEER of necessary alterations or damage to monitoring wells.

1.03 ADJUSTMENT

A. When the grade at an existing monitoring well is changed, adjust grade of well to the new grade.

B. Adjust protective casing so that the top is 2.5-3 feet above final grade. Cut or extend the PVC well casing and end cap, so that it is one inch below the top of the protective casing. Place a 2 foot diameter seal of mortar, two parts sand to one part Portland cement, around the well extending 2 feet below final grade.

C. Lowering grade: Carefully excavate around the well; remove protective casing without damage to the PVC well casing. Cut PVC well casing perpendicular to centerline axis.

D. Raising Grade: Extend PVC well casing using a threaded coupling if possible or slip coupling. Attach the slip coupling to the existing PVC with four screws. The screws should not extend into the inside of the well casing.

1.04 REPAIR

A. Repair any well damaged by the Contractor's operations by excavating to below the broken casing, extending PVC to previous grade, and replacing protective casing and top seal as specified for adjustment.

B. Engineer will inspect well to determine if well is contaminated. If further repair or replacement is needed, it shall be done at no expense to the Owner.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Procedures.

B. Construction Progress Schedules.

C. Schedule of Values.

D. Shop Drawings.

E. Product Data.

F. Manufacturer's Instructions.

G. Samples.

H. Manufacturer's Certificates.

I. Contractor Review.

1.02 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work

B. Section 01410 - Laboratory Quality Control

C. Section 01600 - Materials and Equipment

D. Section 01700 - Contract Closeout

1.03 PROCEDURES

A. Deliver submittals to Site Representative or Engineer.

B. Identify Project, Contractor, subcontractor, major supplier; identify pertinent drawing sheet and detail number, and Specification Section number, as appropriate. Identify deviations from Contract Documents.

C. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.

D. After Engineer reviews submittal, revise and resubmit as required; identify changes made since previous submittal.

E. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.04 CONSTRUCTION PROGRESS SCHEDULE

A. Submit horizontal bar chart with separate bar for each major trade, subcontractor, or operation, identifying first work day of each week.

B. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Show projected percentage of completion of each item of Work as of time of each Application for Progress Payment.

C. Show submittal dates required for shop drawings, product data, and samples, and product delivery dates, including those furnished by Owner.

1.05 SCHEDULE OF VALUES

A. Submit typed schedule in format of Table of Contents of this Project Manual. Identify each line item with number and title of major Specifications Sections.

B. Include in each line item a directly proportional amount of Contractor's overhead and profit.

1.06 SHOP DRAWINGS

A. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Engineer.

B. Present in a clear and thorough manner. Title each drawing with Project name; identify each element of drawings by reference to sheet number and detail of Contract Documents.

C. Identify field dimensions; show relationship to adjacent or critical features of Work or products.

1.07 PRODUCT DATA

A. Mark each copy to identify applicable product, models, options, and other data; supplement manufacturer's standard data to provide information unique to the Work.

B. Submit the number of copies which Contractor requires plus two copies which will be retained by Engineer.

1.08 MANUFACTURER'S INSTRUCTIONS

A. When required by an individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

1.09 SAMPLES

A. Provide field samples as required by individual Specifications Sections. Install sample complete and finished. Acceptable samples in place may be retained in the completed work.

B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

C. Include identification on each sample, giving full information.

D. Submit number specified in respective Specification Section; one will be retained by Engineer. Reviewed samples which may be used in the work are indicated in the Specification Section.

1.10 CONTRACTOR REVIEW

A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements.

B. Coordinate submittals with requirements of Work and of Contract Documents.

C. Sign or initial each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify Engineer in writing at time of submittal of any deviations from requirements of Contract Documents.

D. Do not fabricate products or begin work which requires submittals until return of submittal with Engineer's acceptance.

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Contractor provided testing laboratory services.

1.02 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work

B. Individual Specifications Sections: Inspections and Tests required.

1.03 REFERENCES

A. ANSI/ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E329 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils: Sieve Analysis and Hydrometer.

D. ASTM D698 - Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lbs. Rammer and 12 inch Drop: Standard Proctor.

E. ASTM D1140 - Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieve: P200 Content.

F. ASTM D1556 - Standard Test Method for Density of Soil In Place by the Sand-Cone Method: Sand Cone Density Test.

G. ASTM D1557 - Standard Test Methods for Moisture-Density Relations of Soils & Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop: Modified Proctor.

H. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures: Natural Moisture Content.

I. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth): Nuclear Density Test.

J. ASTM D3017 - Standard Test Method for Moisture Content of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth): Nuclear Moisture Content.

K. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils: Atterberg Limits.

1.04 SELECTION AND PAYMENT

A. Contractor shall employ and pay for services of an independent testing laboratory to perform specified inspection and testing.

B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.05 QUALITY ASSURANCE

A. Comply with requirements of ANSI/ASTM E329 and ANSI/ASTM D3740.

B. Laboratory shall maintain a full-time registered Engineer on staff to review services.

C. Laboratory authorized to operate in State in which Project is located.

D. Testing equipment shall be calibrated at reasonable intervals with devices of an accuracy traceable to either NBS Standards or accepted values of natural physical constants.

1.06 CONTRACTOR SUBMITTALS

A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full-time registered Engineer and responsible officer to Engineer.

B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection, with memorandum of remedies of any difficulties reported by the inspection.

1.07 LABORATORY RESPONSIBILITIES

A. Test samples of mixes submitted by Contractor.

B. Provide qualified personnel at site after due notice; cooperate with Engineer and Contractor in performance of services.

C. Perform specified inspection, sampling and testing of products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.

F. Perform additional inspections and tests until compliance or as required by Engineer.

G. Attend preconstruction conferences and progress meetings as required.

1.08 LABORATORY REPORTS

A. After each inspection and test, promptly submit two copies of laboratory report to Engineer and to Contractor. Include: Date issued, Project Title and number, name of inspector, date and time of sampling or inspection, identification of product and Specifications section, location in the Project, type of inspection or test, date of test, results of test, and conformance with Contract Documents. When requested by Engineer, provide interpretation of test results.

1.09 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on the requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop Work.

1.10 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing, together with proposed mix designs.

B. Cooperate with laboratory personnel, and provide access to work.

C. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at the source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify Engineer and laboratory of operations requiring inspection and testing services 24 hours before services are needed.

E. If tests indicate work does not meet specified requirements, remove work, replace, and retest until compliance is achieved at no cost to the Owner.

1.11 SOILS TESTING

A. Determine the moisture-density relation and maximum dry density by the Standard Proctor Test.

B. Perform one Proctor Test for every type of fill material specified.

C. Engineer may require additional Proctor Tests whenever material changes are detected.

D. Perform a minimum of three field density tests for the first five hundred cubic yards and one additional test for each additional one hundred cubic yards of material in place.

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Electricity, Lighting.

B. Water.

C. Sanitary Facilities.

D. Barriers.

E. Protection of Installed Work.

F. Security.

G. Cleaning During Construction.

H. Field Offices and Sheds.

I. Removal.

1.02 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work

B. Section 01700 - Contract Closeout.

1.03 ELECTRICITY, LIGHTING

A. Provide generators for electricity requirements.
or
B. Make arrangements for temporary power.

1.04 WATER

A. Provide water for construction operations.

1.05 SANITARY FACILITIES

A. Provide and maintain enclosed, portable, self-contained sanitary facilities.

1.06 BARRIERS

A. Provide as required for Owner's use of site, to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage.

1.07 PROTECTION OF INSTALLED WORK

A. Provide temporary protection for installed products.

B. Control traffic in immediate area to minimize damage.

1.08 SECURITY

A. Provide security program and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism and theft. Coordinate with Owner's security program.

1.09 CLEANING DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish; periodically dispose of off-site.

B. Maintain site in a clean and orderly condition.

C. Clean interior plant areas at the end of each day's work; control dust and other contaminants during operations.

1.10 FIELD OFFICES AND SHEDS

A. Office: Weather-tight, equipped with lighting, electrical outlets, heating, cooling, and ventilating equipment, telephone and furniture.

B. Storage Sheds for Tools, Materials and Equipment: Weather-tight, with adequate space for organized storage and access, and lighting for inspection of stored materials.

1.11 REMOVAL

A. Remove temporary materials, equipment, services, and construction prior to final inspection.

B. Restore existing facilities used during construction to specified, or to original, condition.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Products.

B. Transportation and Handling.

C. Storage and Protection.

D. Disposal.

E. Product Options.

F. Products List.

G. Substitutions.

H. Systems Demonstration.

1.02 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work

B. Section 01400 - Quality Control

C. Section 01700 - Contract Closeout

1.03 PRODUCTS

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structure or system, except as specifically required, or allowed by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Transport products by methods which prevent product damage; deliver in undamaged, dry condition in manufacturer's unopened containers or packing.

B. Provide equipment and personnel to handle products by methods which prevent soiling or damage.

C. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

1.05 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to prevent condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to ensure products are undamaged, and are maintained under required conditions.

1.06 DISPOSAL

A. Dispose of excess materials off-site in an appropriate manner.

B. Submit to Engineer the disposal site location before beginning Work.

1.07 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description only: Any product meeting those standards may be used.

B. Products Specified by Naming one or more Manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not specifically named.

C. Products Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications: No options, no substitutions allowed.

D. Products Specified by Naming Only One Manufacturer: No options, no substitutions allowed.

1.08 PRODUCTS LIST

A. Within 15 days after Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.09 SUBSTITUTIONS

A. Engineer will consider Contractor's request for substitutions only within 15 days after Notice to Proceed. Subsequently, substitutions will be considered only when a product becomes unavailable through no fault of Contractor.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. Request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.

2. Will provide the same warranty for substitution as for the specified product.

3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.

4. Waives claims for additional costs which may subsequently become apparent.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.

E. Engineer will determine acceptability of proposed substitution, and will notify Contractor of acceptance or rejection in writing within a reasonable time.

F. Only one request for substitution will be considered for each product. When substitution is not accepted, provide specified product.

1.10 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to Engineer and Owner.

B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Closeout Procedures.

B. Final Cleaning.

C. Project Record Documents.

D. Operation and Maintenance Data.

E. Warranties and Bonds.

F. Spare Parts and Maintenance Materials.

1.02 RELATED REQUIREMENTS

A. Section 01500 - Construction Facilities and Temporary Controls

1.03 CLOSEOUT PROCEDURES

A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.

B. In addition to submittals required by Conditions of the Contract, provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

1.04 FINAL CLEANING

A. Execute prior to final inspection.

B. Clean equipment and fixtures; clean or replace filters of mechanical equipment. Clean interior and exterior surfaces exposed to view. Clean drainage systems.

1.05 PROJECT RECORD DOCUMENTS

A. Store project record documents separately from construction documents.

B. Keep documents current; do not permanently conceal any work until required information has been recorded.

C. At contract closeout, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

1.06 OPERATION AND MAINTENANCE DATA

A. Provide data for: Pumps, Air Stripping Tower, and Soil Vapor Extraction Equipment

B. Submit two sets prior to final inspection, bound in three-ring binders with durable plastic covers.

C. Include directory listing names, addresses, and telephone numbers of: Engineer and Contractor.

D. Operation and Maintenance instructions: Give names, addresses and telephone numbers of subcontractors and suppliers. List:

1. Appropriate design criteria.
2. List of Equipment.
3. Parts list.
4. Operating instructions.
5. Maintenance instructions, equipment.
6. Shop drawings and product data.
7. Warranties.

1.07 WARRANTIES AND BONDS

A. Provide duplicate, notarized copies when specified in specific Section. Execute Contractor's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers. Provide table of contents and assemble in binder with durable plastic cover.

B. Submit material before final application for payment. For equipment put into use with Owner's permission during construction, submit within ten days after first operation.

1.08 SPARE PARTS AND MAINTENANCE MANUALS

A. Provide products, spare parts, and maintenance materials in quantities specified in each section, in addition to that used for construction of Work.

B. Coordinate with Owner; deliver to site before final payment.

END OF SECTION

SECTION 02030

DRILLING, SAMPLING, AND WELL INSTALLATION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This project involves drilling 15 soil borings. Ground water extraction wells will be installed in 9 boreholes. Soil vapor extraction wells will be installed in the remaining 6 boreholes.

B. Water from the installed wells will be sampled and analyzed for various parameters. The testing procedures will detect minute concentrations (parts per billion range) of chemicals, grease, oil and other constituents in the ground water, whether introduced during the well drilling and installation process, or contained in the ground water that the well is intended to sample. Therefore, activities associated with drilling and well installation must be conducted in a manner that will eliminate or minimize the possibility of contaminating the borehole or well.

1.2 GEOLOGIC SETTING

The site is located within the Kings Mountain Belt of the Piedmont Physiographic province. Soils at the site are typically silty, containing varying amounts of fine sand and clay. Saprolitic soils grade downward into a decomposed rock unit ranging from 10 to 40 feet thick. Metamorphic rock types underlie the transitional soils.

1.3 SITE SPECIFIC AND REGULATORY REQUIREMENTS

A. Driller and other drill crew personnel must be familiar with the project drilling specifications and the drilling subcontractor's plan for health and safety, prior to their arrival on-site.

B. Work will be done by experienced personnel, using state-of-the-art equipment in good operating condition and free of leaks (fuel, hydraulic fluid, lubricants, and similar compounds).

C. Drilling and well installation will be completed by a well driller certified by the State of South Carolina. The driller will be responsible for all subcontractor activity on-site, assuring compliance with the specifications and timely completion of the work. The well driller will be responsible for notifying the State of South Carolina of the well installation, upon completion, as required by South Carolina law. Copies of the notification forms will be sent to RMT.

D. The driller will assist the RMT on-site representative in completing a daily field progress report of drilling operations. This report will include: project name, date, drill crew personnel, manufacturer's designation of drill rig, a general description of work completed, and other significant activities. The driller and the RMT on-site representative will each sign the daily report upon completion.

E. Unless approved in writing by RMT, no lubricants or glue shall be used in any manner that might possibly contaminate samples, boreholes or monitoring wells.

F. Any borehole in which no well is installed, will be grouted from the bottom of the borehole to the land surface as specified in Section 3.7 of these specifications and in R.61-71.10 of the South Carolina Well Standards and Regulations.

G. Additional drilling, sampling and well construction information is provided in Table 1.

H. The driller shall be responsible for containing decontanination fluids in DOT approved, 55 gallon open top drums. A decontamination pad is available on-site.

I. Potable water and electrical power are not available on-site. The driller should be prepared to access and haul water from a hydrant located approximately 0.5 miles from the site.

1.4 HEALTH AND SAFETY

A. The drilling subcontractor shall, as a minimum, satisfy all applicable federal, state, and local statutes, regulations, and ordinances regarding health and safety, including, but not limited to, the standards contained in 29 CFR 1926 Construction and Industry and CFR 1910 General Industry, with special attention to 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response, Interim Final Rule, U.S. Department of Labor, Occupational Safety and Health Administration.

B. RMT's Hazard Assessment and Site Health & Safety Plan will be provided. The purpose of the Hazard Assessment and the Site Health & Safety Plan is to identify the potential hazards that RMT employees may be exposed to during activities at the site, and to define the types of training, medical surveillance, personal protective equipment and clothing, monitoring, and work practices and procedures that will be used by RMT employees for their activities at this site. In addition, RMT will furnish or make available to the subcontractor information made available to RMT by Owner that relates to identity, location, quantity, nature, or characteristics of any hazardous substance at, on, or under the site. These documents are for the drilling subcontractor's use in preparing their own health and safety plan for their employees. A copy of drilling subcontractors health and safety plan must be on-site at all times. The drilling subcontractor's employees, agents, and subcontractors shall be in compliance with drilling subcontractor's health and safety plan and procedures for the site.

C. During drilling operations, RMT will be making measurements of air quality for identification of hazards that RMT employees may be exposed to. Measurements will be made near the breathing zone of RMT employees. This information will be available to subcontractor personnel on site to take any action required by the drilling subcontractor's health and safety plan.

1.5 MISCELLANEOUS INFORMATION

A. Drilling, well installation and associated tasks will be observed by RMT personnel on-site; drilling subcontractor personnel shall not be on-site without an RMT representative being present unless specific prior approval is given by RMT.

B. Strict project confidentiality will be maintained. Nonessential personnel should not be on-site. Inquiries from the news media or from the public will be referred to RMT immediately.

1.6 WELL INSTALLATION

The driller shall be responsible for installing the ground water extraction and soil vapor extraction wells as described in this specification.

PART 2 MATERIALS

2.1 WELL CONSTRUCTION MATERIALS

A. When constructing the ground water recovery wells, well casing and screen will be 6-inch inch nominal, with threaded, flush joints. Soil vapor extraction wells will be constructed of 4-inch nominal casing and screen with threaded, flush joints. Casing and screen will be schedule 40 polyvinyl chloride (PVC). Well screens will be machine slotted. Slot size will be 0.010 inch. Casing shall be available on-site in the following lengths: 10 feet, 5 feet and 2 or 2.5 feet. Screen shall be available in lengths of 10 and 5 feet.

B. Filter sand will be Foster-Dixiana FX-50 or an equivalent. If sand other than FX-50 is to be used, the drilling contractor must submit a grain size analysis of the proposed sand to RMT prior to initial mobilization to the project site.

C. Well seals will be made up of bentonite pellets.

PART 3 EXECUTION

3.1 DRILLING METHODS AND PROCEDURES

The primary drilling method for the installation of the ground water extraction wells will be air rotary. Soil vapor extraction wells will be installed using hollow stem auger drilling methods.

3.2 AIR ROTARY

A. Drilling done using air rotary techniques shall use a borehole diameter of 10 inches.

B. Air from the compressor(s) will be cooled and filtered to remove particulates and organics.

C. Samples of the cuttings will be collected by the RMT representative on-site. The drilling subcontractor will be responsible for providing sample jars as described in Section 3.6.1 of these specifications.

D. Fluids generated during the drilling process must be contained in shallow excavations near the borehole. At the conclusion of the drilling and installation process, the contents of the excavation must be pumped into 55 gallon open top drums.

3.3 HOLLOW STEM AUGER

A. Drilling done with hollow stem augers shall use 10-inch O. D. continuous flight augers.

B. In general, soil samples will be collected at five foot intervals beginning at the land surface. Actual sample intervals will be determined by RMT personnel in the field. Additional soil sampling information is detailed in Section 3.5 and Table 1 of these specifications.

3.4 DIAMOND CORE DRILLING

A. If deemed necessary by RMTs on-site representative to determine the nature of the underlying bedrock, the driller must be prepared to advance the borehole by coring. Core drilling will be in accordance with ASTM D 2113. Core size will be NQ.

B. Drilling water will be recirculated. The settling pit (i.e. "mud tub", "sump", etc.) will be covered during drilling operations to reduce the possibility of contaminating the drilling fluid. Equipment, such as hoses or tools, will not be placed in the settling pit if it may introduce contaminants into the drilling fluid.

C. Rock core will be placed in boxes, supplied by the drilling subcontractor. The subcontractor must provide ample spacing blocks to facilitate logging and storing of core.

D. Drilling fluids must be contained in 55 gallon open top drums.

E. The driller will be responsible for installing temporary surface casing prior to advancing the borehole into bedrock. After drilling operations have been completed, the casing will be removed as the extraction well is installed.

3.5 SOIL SAMPLING

Split Barrel Sampling - Soil samples will be collected using a split barrel sampler in accordance with ASTM D 1586. Downhole hammers may not be used. Samples must come precisely from predetermined depths. Augers must be cleanly open to those depths. This may require the use of a plug or similar device to prevent formation material from entering the augers. The drilling subcontractor will supply air tight, boxed sample jars (8 oz.). Two sample jars will be filled for each sample collected, if sufficient sample is recovered. The driller will be responsible for opening the sampler and providing necessary sampling data (i.e. blow counts, sample depths, and etc.) to the RMT on-site representative.

3.6 GROUTING

The driller will be responsible for grouting with a Portland cement slurry containing approximately five percent (5%) powdered bentonite. The grout slurry will be mixed by pump recirculation or other methods acceptable to RMT. When thoroughly mixed, the slurry will be pumped into the borehole ar annulus via a rigid tremie.

3.7 INSTALLATION PROCEDURE

A. Wells will be installed through the hollow stem augers as they are withdrawn from the borehole (or in a clean open borehole). Augers or borehole must be clean and open over their entire length prior to beginning well installation.

B. After drilling is complete, casing and screen will be placed to the desired depth. Once the screen is correctly placed, the annular space around the screen will be packed with filter sand. The sand pack will extend two feet above the top of the screen. The upper surface of the sand pack will be sealed with bentonite pellets. Minimum thickness of the bentonite seal will be two feet. The bentonite pellets will be allowed to hydrate for at least

30 minutes before introducing grout into the borehole. The annular space above the bentonite seal will be grouted to the land surface. A steel protective cover with a lockable cap will be placed over each completed well and secured in the grout column. RMT will provide locks for each well. A concrete pad (2 feet x 2 feet x 4 inches) will be framed and poured around each well. The concrete pad will extend six inches below the ground surface within six inches of the borehole. Concrete will have a slump no greater than four inches. The driller will be responsible for drilling "weep holes" in each protective casing, just above the level of the concrete pad.

C. The drilling subcontractor shall provide RMT with as-built well construction information on forms provided by RMT.

3.8 WELL DEVELOPMENT

A. The driller will be responsible for well development by pumping with a positive displacement PVC pump until discharge is relatively clear and free of sediment. Development time will be approximately three hours per well. A surge block or swab may be necessary for proper development and must be available on-site.

B. The driller will be responsible for documenting well development on forms provided by RMT. Forms will be completed at the time of development and delivered to RMT upon completion.

C. The driller will be responsible for containing development water in DOT approved 55 gallon, open top drums.

3.9 DECONTAMINATION

A. The driller will be responsible for decontamination of the drill rig, downhole tools, sampling equipment, well materials and vehicles.

B. Decontamination will be accomplished as follows:

- Steam clean;
- Rinse thoroughly with tap water;
- Rinse thoroughly with deionized water;
- Rinse twice with pesticide grade isopropanol;
- Rinse thoroughly with organic-free water and allow to air dry:
- Wrap with plastic or aluminum foil to minimize the possibility of contamination if equipment is going to be stored or transported.

C. Well casing and screen will be decontaminated and transported in the same manner as downhole drilling tools prior to being placed in the borehole.

D Well development equipment will be decontaminated and transported in the same manner as downhole drilling tools prior to use.

TABLE 1

Drilling, Sampling and Well Construction Information

Boring Number	Estimate Depth (ft.)	Sampling Interval (ft.)	Borehole Diameter (inches)	Screen Slot Size (inches)	Screen Length (feet)	Well Construction Materials
B-1	155	Continuous[1]	10	0.01	100	6" PVC
B-2	150	Continuous[1]	10	0.01	100	6"PVC
B-3	150	Continuous[1]	10	0.01	100	6"PVC
A-1	155	Continuous[1]	10	0.01	100	6" PVC
A-2	150	Continuous[1]	10	0.01	100	6"PVC
A-3	130	Continuous[1]	10	0.01	90	6"PVC
A-5	115	Continuous[1]	10	0.01	90	6"PVC
A-6	145	Continuous[1]	10	0.01	100	6"PVC
A-7	90	Continuous[1]	10	0.01	80	6"PVC
VE-102	50	5	10	0.02[2]	30	2"PVC
VE-103	50	5	10	0.02[2]	30	2"PVC
VE-201	50	5	10	0.02[2]	30	2"PVC
VE-202	55	5	10	0.02[2]	30	2"PVC
VE-302	65	5	10	0.02[2]	30	2"PVC
VE-303	60	5	10	0.02[2]	30	2"PVC

[1] - Samples will be collected from drill cuttings.
[2] - Screen will be 0.02 inch continuous slot as manufactured by Branard-Killman under the name Circumslot.

SECTION 02102

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Clearing, stripping, and grubbing of trees, shrubs, brush, logs, stumps, plant life, grass, and root systems of trees and shrubs and disposal of debris and spoil.

1.02 RELATED WORK

A. Section 02201 - Excavation

B. Section 02221 - Trench Excavation, Backfill, and Compaction

C. Section 02230 - Fill

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.01 CLEARING AND GRUBBING

A. Remove trees, shrubs, brush, logs, stumps, and natural growth within Construction Limits.

B. Remove stumps, roots, and logs to a minimum depth of 2 feet below ground surface.

3.02 DISPOSAL

A Remove all debris and spoil within 30 days of accumulation and dispose of off-site. Burning of debris is not permitted.

3.03 PROTECTION OF EXISTING TREES AND VEGETATION

A. Preserve and protect from damage trees within the Construction Limit designated on the Drawings.

B. Preserve and protect from damage trees and vegetation outside the Construction Limits.

C. Paint any cut or scarred trees and shrubs with asphaltum base tree paint.

END OF SECTION

B. Area must be cleared and grubbed prior to initiating excavation activities.

3.02 PROTECTION

A. Do not remove or loosen any materials outside the Construction Limits.

B. Keep excavations free from water by pumping or diversion ditching.

3.03 DISPOSAL

A. Haul to and spread Excavation at the on-site location indicated on the Drawings.

B. Use Excavation as Unclassified Fill in accordance with Section 02230.

3.04 STOCKPILING

A. Grade stockpiles to provide positive drainage.

3.05 FINISHING

A. Blend slopes with existing landscape features, at the intersection of cuts and fills; provide gradual slope between new and existing construction.

B. Finish to elevations shown within 0.10 foot tolerance.

END OF SECTION

SECTION 02221

TRENCH EXCAVATION, BACKFILL, AND COMPACTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Trenching, backfilling, and compacting for installation of piped utilities.

B. Dewatering, protection and maintenance of trench, support of existing structures, sheeting and shoring, hauling and disposal of excess materials and fill.

1.02 RELATED WORK

A. Section 01050 - Field Engineering

B. Section 01410 - Testing Laboratory Services

D. Section 02230 - Fill: Fill Materials and Compaction

E. Section 02615 - Pressure Pipe - Schedule 40 & 80 PVC

F. Section 02730 - Gravity Pipe (PVC)

PART 2 PRODUCTS

2.01 BACKFILL MATERIALS

A. Backfill: Select Fill complying with Section 02230.

2.02 BEDDING MATERIALS

A. For all pipes greater than 10 inches in diameter, and Reinforced Concrete Pipe: Washed gravel or crushed stone meeting the following gradation:

Passing 1" sieve	100%
Passing 1/2" sieve	35-65%
Passing #200 sieve	0-10%

B. For all pipes less than 10 inches in diameter:

Select Fill Sand, in accordance with Section 02230

PART 3 EXECUTION

3.01 PREPARATION AND RESTORATION

A. Remove sod, topsoil, and other surface treatment and restore to original condition or better upon completion of the work.

3.02 PROTECTION

A. Protect excavations by shoring, bracing, sheet piling, or other methods required to prevent cave-in or loose soil from falling into excavation.

B. Underpin adjacent structures which may be damaged by excavation work, including utilities and piping.

C. Notify Site Representative immediately of unexpected subsurface conditions.

D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

3.03 TRENCHING

A. Excavate to the required alignment and grade. Elevations of pipes subject to revisions as necessary to fit field conditions.

B. No adjustment in compensation will be made for grade adjustments not in excess of one foot above or below the plan elevations.

C. Maximum trench width at pipe level to be outside pipe diameter plus 24 inches.

D. Remove water which may accumulate in trench, and construct ditches, flumes, and dams to direct water away from excavation.

E. Site Representative may limit the amount of open trench where field conditions or plant operations require.

F. Site Representative may order additional excavation where unsuitable soil conditions are encountered.

G. Promptly dispose of excess excavation off-site.

3.04 UTILITY TEST HOLES

A. Where potential utility conflicts are anticipated, uncover utility lines well in advance of trench excavation.

B. Determine grade of the utility line. Site Representative will advise the Utility Company of the adjustment required.

C. Backfill and maintain openings.

3.05 BEDDING

A. Minimum bedding required to extend from 6 inches below pipe to 12 inches above pipe.

B. Minimum depth of pipe embedment in bedding: one third outside pipe diameter.

C. Mechanically compact bedding.

B. Cut out soft areas of unsuitable subgrade.

C. Proof-roll subgrade before placing fill.

D. When filling is complete, regrade and restore stockpile areas.

3.02 PLACEMENT AND COMPACTION

A. Maintain proper moisture content to achieve specified compaction.

B. Place and spread fill in lift thicknesses as required to obtain the specified levels of compaction. In most cases, maximum lift thicknesses of 6 inches after compaction should not be exceeded.

C. Compact materials immediately after placement.

E. Hand compact Select Granular Fill. Place carefully around piplines.

3.03 STANDARD COMPACTION

A. Compact material to a dry density of at least 90% of the maximum dry density.

3.05 FIELD QUALITY CONTROL

A. Perform one compaction test for every 1000 cubic yards of fill placed, but not less than three tests, under provisions of Section 01410.

B. Grade and finish to within 0.10 feet of grades shown.

END OF SECTION

SECTION 02272

GEOTEXTILE FABRICS FOR CONSTRUCTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide and install Geotextile Fabric where specified on the Drawings.

B. Geotextile fabrics are used for: Silt Fence, Erosion Control and Revegitation Mat, Filter Fabric, and Stabilization Fabric.

1.02 RELATED WORK

A. Section 01500 - Construction Facilities and Temporary Controls

B. Section 02273 - Riprap

C. Section 02551 - Aggregate Base Course

1.03 REFERENCES

A. Tensile Strength Test and Percent Elongation Test in accordance with ASTM D 1682.

B. Burst Strength tested in accordance with Mullen Burst Test, ASTM D 751.

C. Weight tested in accordance with ASTM D 1910.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store out of sunlight and away from moisture.

B. Handle with care so as not to rupture or puncture.

PART 2 PRODUCTS

Products listed below are manufactured by Mirafi, Inc. Charlotte, NC other substitutions are acceptable as provided in section 01600.

2.01 SILT FENCE

A. Mirafi, Inc.: Mirafi 100X.

B. Silt fence is installed to prevent silt laden waters from leaving a construction site. The fabric is attached to stakes that are driven into the ground.

C. Materials:

1. Woven

D. Provide complete system including fabric, stakes (wood or steel), and supporting structure (netting).

2.02 EROSION CONTROL AND REVEGETATION MAT

A. Mirafi, Inc.: Miramat

B. Erosion control and revegetation mat is used to protect newly graded areas from erosion where vegitative cover is proposed.

C. Materials:

1.	Bonded vinyl monofilaments		
2.	Porosity	85 - 90%	
3.	Flexibility	200 mg-cm	ASTM D 1388
4.	Weight	24 oz./sy	ASTM D 3776
5.	Thickness	0.25 inches	ASTM D 1777
6.	Tensile Strength		ASTM D 1682
	a) Longitudinal	18 lbs	
	b) Transverse	6 lbs	

2.03 FILTER FABRIC

A. Mirafi,Inc.: Mirafi 700X

B. Filter fabric is used under riprap to provide stabilization of the subsoils with high water velocities.

C. Materials:

1.	Woven polypropylene		
2.	Grab Tensile Strength	530x310 lbs	ASTM D 1682
3.	Grab Tensile Elongation	35 %	ASTM D 1682
4.	Burst Strength	560 psi	ASTM D 3786
5.	Trapezoid Tear Strength	75 lbs	ASTM D 1117
6.	Puncture Resistance	145 lbs	ASTM D 3787

2.04 STABILIZATION FABRIC

A. Mirafi, Inc.: Mirafi 600X

B. Stabilization fabric provides three characteristics: Separation of aggregate materials, confinement using high friction surface between the subgrade and surface course; and Load Distribution.

C. Materials:

1.	Woven polypropylene		
2.	Modulus (load at 10% elongation)	140 lbs.	ASTM D 1682
3.	Grab Tensile Strength	300 lbs.	ASTM D 1682
4.	Mullen Burst Strength	>600 psi	ASTM D 3786
5.	Trapezoid Tear Strength	120 lbs.	ASTM D 1117

PART 3 EXECUTION

3.01 PREPARATION

A. Provide lay down area and room for 6 inch toe-in trench.

B. Grade area to smooth, uniform surface, and remove all sharp objects (e.i. stumps above grade, sharp edged stones above grade) before placement.

3.02 SILT FENCE INSTALLATION

A. Install hard wood posts 2 feet below grade, at maximum 8-foot spacing.

B. Anchor bottom 6 inches of fence netting below grade to create a continuous toe-in structure along fence installation.

C. Install fence in areas designated on plans.

3.03 STABILIZATION AND FILTER FABRIC INSTALLATION

A. Lap ends of fabric 1 - 1 1/2 feet minumum or as directed by the manufacturer.

B. Roll out fabric manually taking care not to have folds. Roll fabric in straight line.

C. Cover fabric with proper aggregate. Do not drive equipment directly on fabric. Spread aggregate with tracked equipment. Compact as required.

3.04 EROSION CONTROL AND REVEGETATION MAT INSTALLATION

A. Fine grade site prior to installing mat. Seeding and fertilizing may be done either before or after installation of the mat.

B. Roll out mat manually in direction of water flow. Do not attempt to stretch mat.

C. Overlap ends 3 feet and overlap edges 3 inches.

D. Fasten to ground using triangular wooden stakes or long wire staples. Fasteners shall be installed per directions of the manufacturer.

END OF SECTION

SECTION 02273

RIPRAP

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing and placing riprap.

1.02 RELATED WORK

A. Section 02201 - Excavation

B. Section 02271 - Geotextile Filter Fabric

PART 2 PRODUCTS

2.01 MATERIALS

A. Durable field or quarry stone that is sound, hard, dense, resistant to action of air and water, and free from seams, cracks, or other structural defects.

B. Stone pieces ranging in size, with 75% of the pieces between 3 to 12 inches in diameter, and no piece larger than 18 inches in its largest dimension.

C. When approved by Engineer, waste concrete slabs may be substituted for stone, with the same size requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Excavate to the lines and grades required for placement of the riprap.

B. Place Geotextile Filter Fabric over areas to receive riprap.

3.02 PLACEMENT

A. Minimum thickness of riprap is 12 inches.

B. Place riprap to the elevations shown on the plans to within 3 inches tolerance.

C. Place Riprap with care so no damage is done to Geotextile Filter Fabric.

D. Place smaller sized stones to fill voids between the larger sized stones.

END OF SECTION

SECTION 02444

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Excavation for post bases; concrete foundation for posts and center drop for gates.

C. Manual gates and related hardware.

1.2 REFERENCES

A. ANSI/ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

B. ANSI/ASTM F567 - Installation of Chain-Link Fence.

C. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.

D. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless, for Ordinary Uses.

E. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.

F. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

G. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric.

H. ASTM A569 - Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.

I. ASTM C94 - Ready-mixed Concrete.

J. Chain Link Fence Manufacturers Institute (CLFMI) - Product Manual.

K. FS RR-F-191 - Fencing, Wire and Post Metal (and Gates, Chain Link Fence Fabric, and Accessories).

1.3 SYSTEM DESCRIPTION

A. Fence Height: 6 feet nominal.

B. Line Post Spacing: At intervals not exceeding 10 feet.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions,

hardware anchorage, and schedule of components.

C. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

D. Samples: Submit two samples of fence fabric, 12 X 12 inch in size illustrating construction and finish.

E. Manufacturer's Installation Instructions: Indicate installation requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with manufacturer's instructions.

B. Maintain one copy of document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Merchants Metals, Inc. P. O. Box 820, Statesville, NC

B. Robinson Fence Co., 111 Springside Road, Ashville, NC

C. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

A. Framing (Steel): ASTM A120; Schedule 40 steel pipe, standard weight, one piece without joints.

B. Fabric Wire (Steel): ASTM A392 zinc coated wire fabric.

C. Barbed Wire: ASTM A121 galvanized steel 12 gage ([2.5 mm) thick wire, 3 strands, 4 points at 3 inch (75 mm) o.c.

D. Concrete: ASTM C94; Normal Portland Cement, 2,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal sized coarse aggregate.

2.3 COMPONENTS

A. Line Posts: 1.9 inch (48 mm) diameter.

B. Corner and Terminal Posts: 3.5 inch diameter.

C. Gate Posts: 3.5 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Gate Frame: 1.66 inch diameter for fittings and truss rod fabrication.

F. Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 9 gage thick, top selvage twisted tight, bottom selvage knuckle end closed.

G. Tension Wire: 6 gage thick steel, single strand.

H. Tie Wire: Aluminum alloy steel wire.

2.4 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Extension Arms: Cast steel galvanized to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.

D. Gate Hardware: Fork latch with gravity drop; two - 180 degree gate hinges per leaf and hardware for padlock.

2.5 FINISHES

A. Components and Fabric: Galvanized to ANSI/ASTM A123; 2.0 oz/sq ft coating.

B. Hardware: Galvanized to ASTM A153, 2.0 oz/sq ft coating.

C. Accessories: Same finish as fabric.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with manufacturer's instructions.

B. Set intermediate, terminal and gate posts plumb, in concrete footings with top of footing 2 inches (50 mm) above finish grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finish Grade: 2 feet.

D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 3 feet.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.

F. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

G. Install center brace rail on corner gate leaves.

H. Stretch fabric between terminal posts or at intervals of 100 feet (30 m) maximum, whichever is less.

I. Position bottom of fabric 2 inches above finished grade.

J. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches (380 mm) on centers.

K. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

L. Install bottom tension wire stretched taut between terminal posts.

M. Install support arms sloped outward and attach barbed wire; tension and secure.

N. Install gate with fabric and vertical barbed wire to match fence. Install three hinges per leaf, latch, catches, drop bolt.

O. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

3.2 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 02511

AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Construct a single-course, dense, compacted gravel access road.

1.02 RELATED WORK

A. Section 02201–Excavation

B. Section 02230–Fill

C. Section 02272 - Geotextile Fabrics for Construction

1.03 SUBMITTALS

A. Submit test results under provisions of Section 01300, indicating that the Crushed Stone meets the required specifications.

B. Crushed Concrete may be allowed. Submit applicable test results and request for substitution under Section 01600. Also submit source of supply; Engineer may make visual inspection.

PART 2 PRODUCTS

2.01 AGGREGATE

A. Aggregate shall be crushed stone or crushed gravel, free from lumps or balls of clay or other objectionable matter, and reasonably free from thin and elongated pieces of dirt. Aggregates shall consist of angular fragments, durable and sound and shall be reasonably uniform in density and quality.

B. Percentage of ware shall not exceed 50 after 500 revolutions and determined by ASTM C 131.

C. Aggregate shall contain 75 percent by weight of pieces with two or more fractured surfaces if material is crushed gravel.

D. Portion of aggregate passing No. 40 sieve shall be as follows:

Liquid Limit:	Not more than 25 determined by ASTM D 4318.
Plastic Index:	Not more than 6 determined by ASTM D 4318.

E. Gradation shall conform to Type 1 or Type 2 composite mixture gradation as specified in Section 306 - Stabilized Aggregate Base Course of SC DH& PT.

PART 3 EXECUTION

3.01 INSPECTION

A. Engineer to inspect and approve subgrade to base course construction.

B. Apply water to dry foundations before placement and rework or recompact as necessary.

3.02 PLACEMENT

A. Cold-Weather Limitations:

1. Base-course construction shall be prohibited when atmospheric temperature is below 35 degrees F.

2. Do not place base course on frozen subgrade.

3. Protect base course and subgrade in freezing weather and repair areas damaged by freezing by reshaping and recompacting.

B. Preparation of Subgrade:

Clean of all foreign substances. Remove all unsuitable materials and replace with fill materials. Correct any ruts or soft yielding spots or any areas with inadequate compaction. Perform all wetting, drying, shaping and compacting required to a suitable subgrade. Compact Subgrade as specified in Section 02230. Inspect for adequate compaction and surface tolerances.

C. Grade Control

Establish and maintain by means of grade stakes.

D. Mixing and Placing of Materials:

Method shall be stationary plant or road-mix method at Contractor's option.

1. Stationary Plant Method:

a) Mix aggregate and water and make adjustments in aggregate, water, and mixing time as required.

b) Deposit and spread material in a uniform layer and compact to the thickness indicated and as specified below. Spread material uniformly on the prepared subgrade from moving vehicles or spreader boxes.

c) Level material to the required contour and grades with blade graders.

d) Remove those portions of the layer which become segregated in spreading and replace with satisfactory mixture or remix as requested by the Engineer.

2. Road-Mix Method:

a) Place material without segregation of sizes and spread from spreader boxes or moving vehicles equipped to spread material in layers of uniform thickness.

b) Mix materials with blade graders, harrows, discs, or other approved equipment. Continue initial mixing until the mixture is uniform throughout.

c) Add water to the extent necessary to prevent segregation during mixing operations.

d) Add material to the mixture in such amounts and sizes as requested by the Engineer.

E. Shaping and Compacting Mixed Materials:

1. Compact in layers no less than three nor more than eight inches thick.

2. Roll to specified compaction requirements throughout full depth of layer with tamping rollers, power rollers, rubber tired rollers or combination.

3. Shape and smooth by blading and rolling with power roller or rubber tired roller, or both.

4. Hand-tamp in places not accessible to rolling equipment.

5. Aerate by blading graders, harrows, or other approved equipment when mixture is moistened by rain.

F. Degree of Compaction:

Base compaction on weight per cubic foot of material passing 3/4-inch sieve and compact to at least 98 percent of maximum density at optimum moisture as determined by ASTM D 698.

G. Compaction Testing:

1. The method of in-place compaction testing shall be as follows:

a) Density - ASTM D 2922 (Nuclear Density Meter)
b) Moisture Content - D 3017

2. The minimum frequency of density and moisture content tests bill be as follows:

a) At least one test each of density and moisture control every 2500 square feet of aggregate base course.

b) At least one test each of density and moisture control when the Engineer suspects the quality of moisture control or effectiveness of compaction.

3. Remove or scarify and recompact aggregate base course failing to meet required densities.

4. Removal of in-place material and replacement with approved new material will be required if scarifying and recompaction do not produce the required densities.

H. Surface Tolerances:

1. Finished aggregate base course shall not be lower than indicated not higher than 0.1-foot above that indicated.

2. Correct any deviation in excess of this amount by loosening, adding or removing material, reshaping, watering, and compacting as requested by the Engineer.

I. Maintenance:

Maintain finished aggregate base course in a condition satisfactory until approved and accepted by the Engineer.

END OF SECTION

SECTION 02605

MANHOLES AND CLEANOUTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Providing precast manhole sections, jointing materials, bases, top or cones, adjusting rings, connections, castings, and appurtenances.

1.02 RELATED WORK

A. Section 02221 - Trench Excavation, Backfill, and Compaction.

B. Section 02730 - Gravity Sewer Pipe (PVC).

1.03 REFERENCES

A. Precast Concrete Manholes and Adjusting Rings:
ASTM C 478 Standard Specification for Precast Reinforced Concrete Manhole Sections.

B. Castings: ASTM A 48 Grade 30 Specifications for Gray Iron Castings.

C. Rubber Gaskets: ASTM C 443 Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

D. Flexible Plastic Gaskets: Type B AASHTO M 198 Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets, Type B Flexible Plastic Gaskets.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Castings: Neenah Foundry Company, Neenah, Wisconsin; East Jordan Iron Works, Inc., East Jordan, Michigan.

B. Substitutions: under provisions of Section 01600.

2.02 MATERIALS

A. Precast Concrete Manholes conforming to ASTM C 478.

1. Manhole Base: precast.

2. Joints: O-rings.

3. Pipe Connections: water stop gaskets or core and boot seals.

4. Manhole Steps: Plastic, steel reinforced, spaced 12 inches on center, continuous.

B. Manhole Castings

1. Frame and Cover

C. Mortar: Three parts masonry sand and one part Portland Cement by volume.

PART 3 EXECUTION

3.01 INSTALLATION

A. Pipe Connection: use water stop gasket or rubber boot to provide smooth, watertight connection around pipe.

B. Form invert of manhole with stiff mortar and trowel smooth.

3.02 ADJUSTING CASTING

A. Provide minimum of 12 inches of precast concrete, adjusting rings, maximum of 18 inches of adjustment.

B. Provide full 3/8 inch thick mortar beds for setting rings and casting.

C. Apply plaster coat of mortar to inner and outer surface of adjusting rings.

END OF SECTION

SECTION 02606

METERING MANHOLE

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish and install a totally intergrated fiberglass package metering manhole.

B. Installation will include a concrete base.

1.2 RELATED WORK

A. Section 02221 - Trench Excavation, Backfill and Compaction

B. Section 02730 - Gravity Pipe (PVC)

1.3 SUBMITTALS

A. Submitt catalogue cut sheets detailing manhole and hold down lug locations.

B. Submitt installation installation details

1.4 REFERENCES

A. ASTM D 3753 - Standard Specification for Fiber Reinforced Manholes

PART 2 PRODUCTS

2.1 Design Requirements:

A. The Metering Manhole shall be a completely intergral unit consisting of: A 48 inch corrosion resistant fiberglass reinforced plastic (FRP) manhole with sealed fiberglass bottom, 48 inch diameter hinged fiberglass cover with locking hasp, fiberglass access ladder, metering flume and internal instrument racks as required. The flume shall be a 3 inch Parshall type with end couplings sized to meate with 8 inch outside diameter incommong and out gouing PVC pipe. Two neoprene boots with stainless steel clamps sized to connect inlet and outlet poipes to the flume adapter. The manhole will be equipped with hold-down brakets for anchoring the unit to a concrete slab. Provide a 1/2 inch thick expanded polystyrene bead board for placement under the manhole.

B. The flume shall be equipped with a pocket for a capacitance probe.

2.2 ACCEPTABLE MANUFACTURER

A. Plasti-Fab, Inc
P. O. Box 100
Tualatin, OR 97062

B. Local Representative: Johnston, Inc., Indian Trail, NC.

PART 3 EXECUTION

3.1 BASE

Install reinforced concrete cast-in-place base. Top shall be no more than 1/8 inch out of level in 4 feet. Base shall be a minimum 2 feet larger than the inside diameter of the manhole.

3.2 MANHOLE INSTALLATION

The manhole shall be installed on the concrete base. A 1/2 inch thick expanded polystyrene bead board will be supplied for placement on the concrete slab under the manhole. Lift the manhole into place. Do not roll.

3.3 ANCHOR BOLTS

Install drill-in type anchor bolts at the hold-down lugs. Tighten to the manufacturer's recommended torque.

3.4 PIPE LINE CONNECTIONS

Install rubber connector sleeves, furnished with manhole, over the pipeline at the inlet and outlet of the manhole. Tighten stainless steel bands to seal sleeve to pipeline.

3.5 INSTRUMENTATION

Instrumentation will be furnished and installed under the Electrical Sections.

END OF SECTION

SECTION 02613

CORRUGATED STEEL PIPE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide corrugated metal pipe and appurtenances.

1.02 RELATED WORK

A. Section 01563 - Temporary Water Control

B. Section 01600 - Material and Equipment: Delivery, storage and handling.

C. Section 02221 - Trenching, Backfilling and Compacting

D. Section 02230 - Fill

1.03 REFERENCES

A. AASHTO M36 Standard Specifications for Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.

1.04 UNIT PRICES

A. Measure and pay for Corrugated Metal Pipe by the lineal foot in place. Fittings, apron end walls, concrete collars and other miscellaneous appurtenances are incidental to the installation of Corrugated Metal Pipe.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armco Steel Corporation
Metal Products Division
Middletown, Ohio 45042

B. Republic Steel Corporation
Drainage Products Division
1436 Banbury Drive NE
Grand Rapids, MI 49505

C. Substitutions: under provisions of Section 01600.

2.02 MATERIALS

A. Corrugated Steel Pipe: [state size, welded or riveted, etc], complying with AASHTO M36.

B. Joints: [O-ring gasketed with _____ Hugger band joint with external galvanized rods *and lug connections, or smooth stab-type connections*]

C. Metal Apron End Walls: [___ diameter, riveted, and complying with AASHTO M36.]

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect pipe, fittings, and other appurtenances before installation to verify quality of materials.

B. Bends to be prefabricated.

3.02 PREPARATION

A. Remove dirt and foreign material from pipe before assembly.

3.03 INSTALLATION

A. Install pipe and appurtenances to the line and grade shown on the Drawings.

B. Backfill with care to ensure complete filling and compaction.

C. Form field joints by joining sections together with a band bolted firmly in place.

D. The maximum tolerance for grade is 0.10 foot.

3.04 FIELD QUALITY CONTROL

A. Engineer to make visual inspection prior to backfilling.

END OF SECTION

SECTION 02615

PRESSURE PIPE - SCHEDULE 40 & 80 PVC

PART 1 GENERAL

1.1 WORK INCLUDED

A. Solid wall pipe used for vacuum and pressure service.

B. Pipe fittings to match the schedule of the connecting pipe.

1.2 RELATED WORK

A. Section 01600 - Material and Equipment: Delivery, Storage, and Handling

B. Section 02221 - Trenching, Backfilling, and Compacting

C. Section 02230 - Fill

D. Section 02620 - Jet Pump Systems

E. Section 02641 - Valves

1.3 REFERENCES

A. ASTM F402 - Practice for safe handling of solvent cements and primers used for joining thermoplastic pipe and fittings.

B. ASTM D1784 - Specification for rigid Poly (Vinyl Chloride) (PVC) compounds and chlorinated Poly (Vinyl Chloride) (CPVC) compounds.

C. ASTM D1785 - Poly (Vinyl Chloride) (PVC) plastic pipe, Schedules 40, 80, and 120.

D. ASTM D2464 - Threaded Poly (Vinyl Chloride) (PVC) plastic pipe fittings, Schedule 80.

E. ASTM D2466 - Socket-type Poly (Vinyl Chloride) (PVC) plastic pipe fittings, Schedule 40.

F. ASTM D2467 - Socket-type Poly (Vinyl Chloride) (PVC) plastic pipe fittings, Schedule 80.

G. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) plastic pipe and fittings.

H. ASTM D2672 Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.

I. ASTM D2774 - Practice for Underground Installation of Thermoplastic Pressure Piping.

J. ASTM D2855 - Making Solvent-Cemented joints with Poly (Vinyl Chloride) (PVC) pipe and fittings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01600 - Material and Equipment.

B. Protect pipe from the sun and heat sources. Provide adequate ventilation.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01300.

B. Include data on pipe materials, pipe fittings, primer description, solvent cement type and accessories.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Pipe:

Eslon Thermoplastics, Inc.
P.O. Box 240696
Charlotte, NC 28224

Carlon Electrical Sciences, Inc.
25701 Science Park Dr.
Cleveland, OH 44122

Harvel Plastics, Inc
P. O. Box 757
Easton, PA 18042

Charlotte Pipe and Foundry Co.
P.O. Box 35430
Charlotte, NC 28235

Substitutions: Under provisions of Section 01600.

B. Fittings shall be manufactured by the pipe supplier.

2.2 MATERIALS

A. PVC material used in the manufacture of the pipe and fittings shall conform to cell designation 12454-B (formerly known as Type 1, Grade 1) as defined by ASTM D1784.

B. PVC Pipe: ASTM D1785, ASTM D2466 and ASTM D2467 solid wall with socket-type ends, complete with required couplings and fittings.

C. Joints: Threaded connections shall use American Standard Taper Pipe threads and joint compounds using tetrafluoroethylene resins. Solvent weld shall conform to ASTM D2855, except heavy-bodied solvent cement shall be used for all pipe sizes and schedules.

D. Primers: ASTM F402 and F656.

E. Solvent Cements: ASTM D2564.

F. Supply pipe for the work by the same manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect pipe, fittings, and other appurtenances before installation to verify quality of material.

B. Confirm pipe schedule, size and designation prior to installation.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove dirt and foreign material, inside and outside, from pipe and fitting materials before assembly.

C. Make straight field cuts without chipping or cracking pipe.

3.3 INSTALLATION

A. Form joints in accordance with the jointing method specified.

B. Install pipe and fittings to the line and grade specified on the drawings with bell end upstream.

C. Lay pipe from the low end towards the high point. Provide continuous, smooth invert.

D. The maximum allowable tolerance for grade is 0.05 feet.

E. Construct Select Granular Fill for the pipe bed as well as over the pipe, with care to avoid damage to the pipe. Minimize traffic and turning of traffic over pipe.

3.4 FIELD QUALITY CONTROL

A. Engineer to make visual inspection prior to backfilling.

B. When using solvent weld joints, provide adequate ventilation for solvent.

C. Flush pipe with sewer cleaning equipment when construction is completed, prior to final acceptance.

D. Pressure test the system in accordance with accepted testing proceedures.

END OF SECTION

SECTION 02620

JET PUMP SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide and install a jet pump system in each production well noted.

B. The system consists of the venturi-type eductor, suction piping and check valves, supply piping and hose, and the double pipe pitless adaptor.

1.2 RELATED WORK

A. Section 02030 - Drilling, Sampling and Well Installation

B. Section 02615 - Pressure Piping - Schedule 40 & 80 PVC

C. Section 02641 - Valves

1.3 SUBMITTALS

A. Comply with Sections 01300 and 01600.

B. Submit catalogue cut sheets for each type of piece provided.

PART 2 PRODUCTS

2.1 HOSE

A. High pressure flexible hose consisting on an inner fluid carrying tube wrapped by a braided reinforcement with an outer protective covering. Minimum operating pressure of the hose shall be 200 psi.

B. Hose shall be supplied with crimpped, male pipe fittings at each end.

C. Hose shall be Aeroquip number 2681 or approved equal.

2.2 EDUCTOR

A. The eductor shall be a two piece cast bronze venturi type jet. It shall have machined throat section and three pipe connections: supply, discharge, and suction. Nominal size shall be 1 inch.

B. The eductor shall be manufactured by Penberthy as model number LH.

2.3 PITLESS ADAPTER

A. A pitless adapter is a means of connecting pipes through the well casing. Once installed no access is required to the installation. The adapter shall be designed for

two pipes: 1-inch supply and a 1¼-inchreturn. The adapter shall be made of red brass and be machined for an O-ring seal and supporting lip.

B. The pitless adapter shall be Model LD-2-X as manufactured by Midwest-Dicken Manufacturing Co., Huntley, IL or approved equal.

2.4 PIPING AND VALVES

A. Piping shall be PVC Pressure Pipe Schedule 80, with threaded fittings.

B. Double check valves shall be installed in the suction line.

2.5 BAILER SLEEVE

A. A bailer sleeve for providing access into the well without interfering with the jet pump piping shall be provided. The sleeve shall be Schedule 80, flush threaded PVC well casing pipe furnished with O-rings. Pipe and threads shall be in accordance with ASTM F 480.

B. The bottom 10 feet of the sleeve shall be machine slotted screen with a slot size of 0.01 inches. A standard well bottom plug shall be fitted on the bottom of the screen.

PART 3 EXECUTION

3.1 INSPECTION

A. Check pipe and hose designations, sizes and lengths before assembly.

B. Check proper operation of the valves.

3.2 PREPARATION

A. Preassemble PVC pipe around jet eductor. Measure to insure assembly will fit into 6-inch well casing.

B. Install pitless adaptor on well casing.

3.3 INSTALLATION

A. Make up all pieces and hydrostatic pressure test at 200 psi. If no visable leaks are observed then continue with installation. Tighten or remake leaking joints and retest.

B. Install bailer sleeve into well.

C. Install jet pump assembly carefully into well and insert into pitless adaptor.

END OF SECTION

SECTION 02641

VALVES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide valves and appurtenances as shown on the plans and as specified herein.

1.02 RELATED WORK

A. Section 01500 - Construction Facilities and Temporary Controls

B. Section 01600 - Material and Equipment: Delivery, storage and handling.

C. Section 02221 - Trenching, Backfilling and Compacting

D. Section 02230 - Fill

E. Section 02615 - Pressure Pipe Schedule 40 & 80 PVC

PART 2 PRODUCTS

2.01 GENERAL MATERIAL DESCRIPTION

A. Valves and appurtenances shall be the type, size and class shown on the plans. Valves aboveground or installed within structures shall have socket weld ends. Valves shall be furnished with operating devices as specified or shown. Valves shall be at least the same class as the pipe on which they are used. All exposed metal valves shall be shop primed.

B. Substitutions: under provisions of Section 01600.

2.02 VALVE TYPES AND MATERIALS

A. Ball Valves

B. Check Valves

C. Globe Valves

D. Air Release Valves

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect valves before installation to verify quality of materials.

B. Check that the proper valve type and jointing system is being used.

3.02 PREPARATION

A. Remove dirt and foreign material from valve before assembly.

3.03 INSTALLATION

A. Install valves in the locations and positions shown on the Drawings.

B. On subsurface installations backfill with care to ensure complete filling and compaction. Provide valve box over actuator.

3.04 FIELD QUALITY CONTROL

A. Engineer to make visual inspection prior to backfilling.

END OF SECTION

SECTION 02730

GRAVITY SEWER PIPE (PVC)

PART 1 GENERAL

1.1 WORK INCLUDED

A. Install a gravity sewer line from the treatment plant site to the outfall as shown on the drawings.

1.2 RELATED WORK

A. Section 02221 - Trenching, Backfill and Compaction

B. Section 02605 - Manholes and Cleanouts

1.3 REFERENCES

A. ASTM D2321 Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

B. ASTM D2665 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

C. ASTM D2672 Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.

D. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings. Use gasketed joints only.

E. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

F. ASTM F 477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01600 - Material and Equipment.

B. Protect pipe from the sun and heat sources. Provide adequate ventilation.

1.5 SUBMITTALS

A. Comply with Sections 01300 and 01600.

B. Submit catalogue cut sheets for pipe, fittings, and jointing system.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Pipe:

Eslon Thermoplastics, Inc.
P.O. Box 240696
Charlotte, NC 28224

Carlon Electrical Sciences, Inc.
25701 Science Park Dr.
Cleveland, OH 44122

Harvel Plastics, Inc
P. O. Box 757
Easton, PA 18042

Charlotte Pipe and Foundry Co.
P.O. Box 35430
Charlotte, NC 28235

Substitutions: Under provisions of Section 01600.

B. Fittings shall be manufactured by the pipe supplier.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect pipe, fittings, and other appurtenances before installation to verify quality of material.

B. Confirm pipe schedule, size and designation prior to installation.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove dirt and foreign material, inside and outside, from pipe and fitting materials before assembly.

C. Make straight field cuts without chipping or cracking pipe.

3.3 INSTALLATION

A. Form joints in accordance with the jointing method specified.

B. Install pipe and fittings to the line and grade specified on the drawings with bell end upstream.

C. Lay pipe from the low end towards the high point. Provide continuous, smooth invert.

D. The maximum allowable tolerance for grade is 0.05 feet.

E. Construct Select Granular Fill for the pipe bed as well as over the pipe, with care to avoid damage to the pipe. Minimize traffic and turning of traffic over pipe.

3.4 FIELD QUALITY CONTROL

A. Engineer to make visual inspection prior to backfilling.

B. When using solvent weld joints, provide adequate ventilation for solvent.

C. Flush pipe with sewer cleaning equipment when construction is completed, prior to final acceptance.

D. Pressure test the system in accordance with accepted testing proceedures.

END OF SECTION

3.03 PLACEMENT

A. Place topsoil to a uniform depth of 6 inches.

B. Finish grade to elevations shown within 0.10 foot.

C. Break down clods and lumps.

END OF SECTION

mixtures available in any locale requires careful scrutiny as to soil types, type of service expected, degree of traffic and use, as well as life expectancy and maintenance expected.]

Common Name of Seed	Lbs. per Acre	Planting Dates
A. Type 1R		
Common Bermuda (hulled)	20	March 15-
Sericea Lespedeza (scarified)	50	Aug. 14
Kentucky 31 Fescue	50	
Pensacola Bahia	15	
B. Type 1U		
Common Bermuda (hulled)	20	March 15-
Sericea Lespedeza (scarified)	50	Aug. 14
Kentucky 31 Fescue	60	
C. Type 2R		
Kentucky 31 Fescue	50	Aug. 15-
Sericea Lespedeza (unhulled, unscarified)	80	March 14
Common Bermuda (hulled)	30	
Pensacola Bahia	30	
Reseeding Crimson Clover	20	
Annual Ryegrass	5	
Rye Grain	20	
D. Type 2U		
Kentucky 31 Fescue	80	Aug. 15-
Sericea Lespedeza (unhulled, unscarified)	80	March 14
Common Bermuda (hulled)	30	
Annual Ryegrass	15	
E. Type T1		
Annual Sudan Grass (Sweet or Tift)	40	April 1- Aug. 15
F. Type T2		
Brown Top Millet	50	April 1- Aug. 15
G. Type T3		
Rye Grain	55	Aug. 16-
Annual Ryegrass	15	March 31

2.02 ACCESSORIES

A. Mulching Material: Oat or wheat, straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

SECTION 02931

SEEDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Preparation of topsoil.

B. Seeding.

C. Hydroseeding.

D. Mulching.

1.02 RELATED WORK

A. Section 02230 - Fill

B. Section 02921 - Topsoil

C. Section 02935 - Fertilizer

1.03 DEFINITIONS

A. Weeds: Includes, but is not limited to, Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Seed which is wet, moldy, or otherwise damaged is not acceptable.

PART 2 PRODUCTS

2.01 SEED MIXTURE

[Review local DOT Specifications or consult in-house landscape architects to ascertain best seed mixture for intended use and climate conditions. Edit section carefully. The wide range of seed

B. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.01 INSPECTION

A. Beginning of installation means acceptance of existing site conditions.

3.02 PREPARATION OF TOPSOIL

A. Smooth topsoil to finish grades.

B. Remove stones or objects over 2 inches in diameter, foreign materials, weeds, and undesirable plants and their roots. Remove contaminated topsoil.

C. Apply fertilizer immediately before seeding in accordance with Section 02935.

3.03 SEEDING

A. Apply seed at the rate specified for the seed type, evenly in two intersecting directions. Rake in lightly.

B. Do not sow immediately following rain, when ground is too dry, or during windy periods.

3.04 HYDROSEEDING

A. Apply seeded slurry at a rate of [_____] lbs. per 1000 sq. ft. evenly in two intersecting directions, with a hydraulic seeder. Do not hydroseed area in excess of that which can be mulched on same day.

3.05 MULCHING

A. Immediately following mulching, roll mulched area. On large areas, a cultipacker may be used to roll and cover the seed.

3.06 WATERING

A. Apply water with a fine spray immediately after each area has been mulched. Saturate soil to a depth of 4 inches.

B. Keep the surface layer of soil damp by frequent light watering with a fine spray during the germination period when rainfall is insufficient.

END OF SECTION

SECTION 11510

CENTRIFUGAL PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Base mounted pumps.

1.2 RELATED SECTIONS

A. Section 15170 - Motors.

B. Section 15260 - Piping Insulation.

C. Section 15280 - Equipment Insulation.

D. Section 16180 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES

A. UL 778 - Motor Operated Water Pumps.

B. NFPA 70 - National Electrical Code.

1.4 PERFORMANCE REQUIREMENTS

A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

D. Millwright's Certificate: Certify that base mounted pumps have been aligned.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacture, assembly, and field performance of pumps with minimum three documented years experience.

B. Alignment: Base mounted pumps shall be aligned by qualified millwright.

1.8 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.9 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide one set of mechanical seals for each pump.

PART 2 PRODUCTS

2.1 BASE MOUNTED PUMPS

A. Goulds Pumps, Inc Product Model 3196 MTX.

B. Substitutions: Under provisions of Section 01600.

C. Type: Horizontal shaft, single stage, direct connected, veritcally split casing, for 250 psig (1720 kPa) maximum working pressure.

D. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, drain plug, flanged suction and discharge.

E. Impeller: Bronze, fully open, keyed to shaft.

F. Bearings: Grease lubricated roller or ball bearings.

G. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

H. Seal: Carbon rotating against a stationary ceramic seat, 212 degrees F (107 degrees C) maximum continuous operating temperature.

I. Drive: Flexible coupling with coupling guard.

J. Baseplate: Cast iron or fabricated steel with integral drain rim.

K. Performance:

	Flow (gpm)	Head (feet)
1. System "A" Pump	300	320
2. System "B" Pump	250	360

L. Electrical Characteristics:
1. 50 hp.
2. 230 volts, three phase, 60 Hz.

3. Refer to Section 16180.
4. Motor: 3550 rpm unless specified otherwise; refer to Section 15170.
5. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches (102 mm) and over. [Refer to Section 15245.]

D. Provide line sized shut-off valve and [strainer] [pump suction fitting] [_____] on pump suction, and line sized [soft seat check valve and balancing valve] [combination pump discharge valve] on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Check, align, and certify alignment of base mounted pumps prior to start-up.

G. Install base mounted pumps on concrete slab with anchor bolts, set and level, and grout in place.

H. Lubricate pumps before start-up.

3.3 SCHEDULES

Drawing Code	P-1	P-2
Manufacturer		Goulds
Model		3196 MTX
Seal Type		Mechanical
Flow Capacity (gpm)	300	250
Head Pressure (feet)	320	360
Efficiency (Min)	63%	60%
Impeller Diameter	8.7"	9.1"
Shut-off Head	350	395
Motor Size	50	50

END OF SECTION

SECTION 13208

TANKS (FIBERGLASS WOUND)

PART 1 - GENERAL

1.1 DISCRIPTION

The tank is to be used to hold recovered water from the groundwater recovery system. It will also be used as a wet well for the recirculation pumps. Excess returned water will overflow into a treatment system. The tank is to be mounted on a concrete pad and will be exposed to outside ambient conditions in the mid-South. The tank may be fitted with heating cables to prevent freezing of the contained liquid.

1.2 REFERENCES

Tank shall be constructed in accordance with ASTM Designation D 3299-88.

1.3 SUBMITTALS

Submit drawings, catalog cut sheets and material of manufacture data as required in Section 1300.

1.4 JOB CONDITIONS

The constituents of concern, their concentration in the groundwater to be stored are listed in the following table:

Contaminate	Untreated influent (ppm)
1,2-Dichloroethane	0.002-1.2
1,1-Dichloroethane	0.002-2.8
1,2-Dichloroethene	0.001-0.028
Tetrachloroethene	0.026-0.49
1,1,1-Trichloroethane	0.001-2.8
1,1,2-Trichloroethane	0.003-0.016
Trichloroethene	0.008-1.4

Operating Criteria:

Average overflow	100 gpm
Minimum water temperature	55°F
Maximum water temperature	95°F
Minimum air temperature	18°F
Maximum air temperature	95°F

PART 2 - PRODUCTS

2.1 MANUFACTURERS

The tank manufacturer shall have manufactured this type of tank for a continuous period of five years.

2.2 MATERIALS

A. Resin shall be a commercial-grade corrosion-resistant thermoset with untraviolet absorbers added to improve weather resistance.

B. Glass fiber reinforcement shall be commercial-grade E-type.

2.3 FABRICATION

A. Tank shall be designed as having a fully supported bottom.

B. Tank shall be provided with hold downs that are intergrally wound into the tank wall.

C. Tank shall be provided with the nozzles as shown on the attached data sheet.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine the unit carefully when it arrives on-site for damage from shipping and loading. Check for spare parts and manuals.

3.2 INSTALLATION

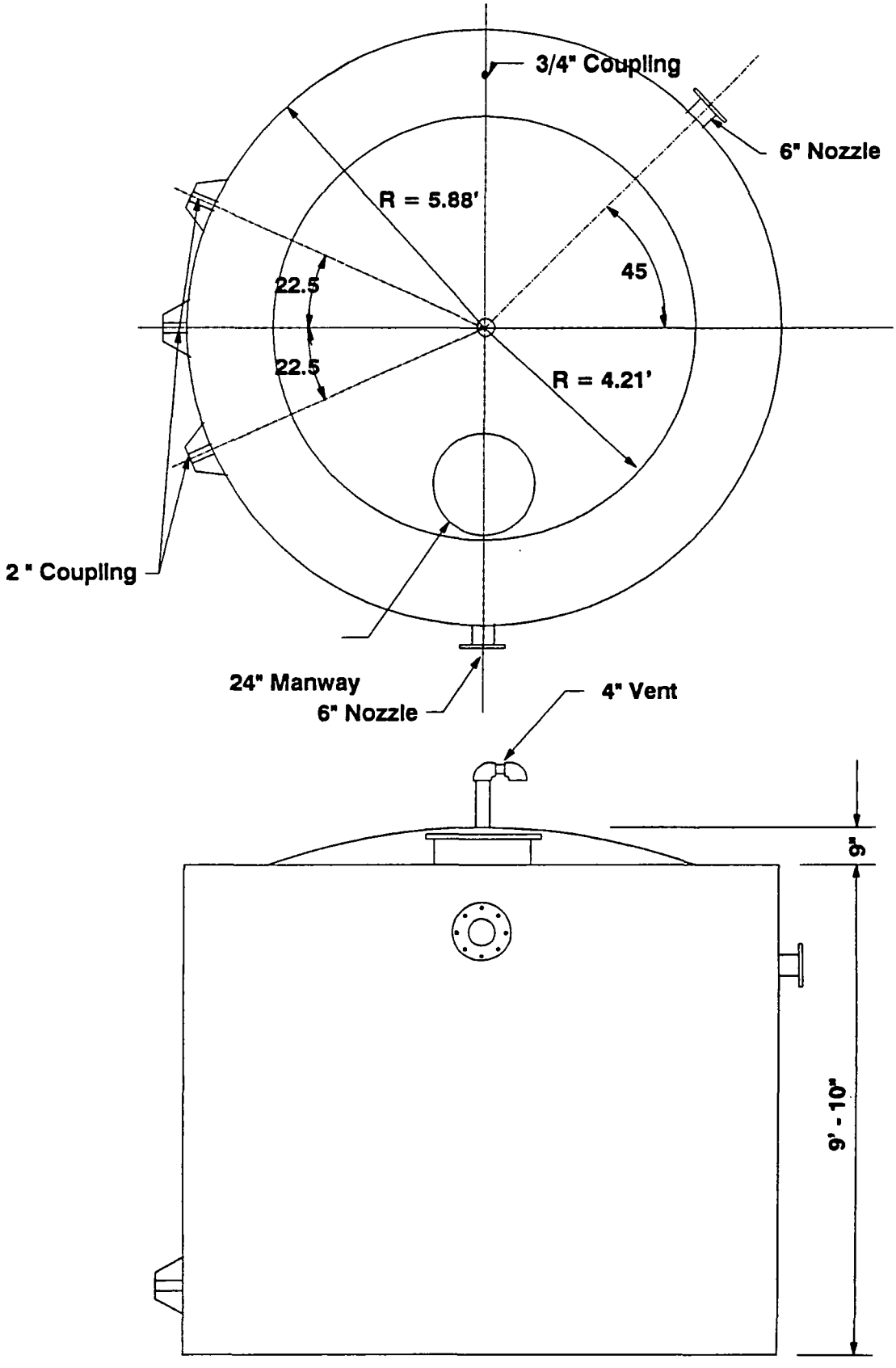
Tank shall be installed in the location shown on the drawings. Lifting lugs shall be used to lift the tank. Tank nozzles shall not be used to support the attached piping.

3.3 PROTECTION

Provide clear zone around the unit to prevent accidental hitting, or movement, both at the storage area and after installation.

(Tank Data Sheet Follows This Sheet)

TANK DATA SHEET



END OF SECTION
13208-3

SECTION 13235

AIR STRIPPING SYSTEM

PART 1 - GENERAL

1.01 SYSTEM DISCRIPTION

The air stripping system will remove organic compounds from the groundwater. The groundwater is aerated by passing through perforated trays and forcing air up through the perforations. The resulting turgulent action and high surface area allow the disolved organic compounds to be released to the atmosphere and discharged with the forced air.

1.02 SUBMITTALS
Submit drawings, catalog cut sheets and operating and maintenance data as required in Section 1300

1.03 JOB CONDITIONS

The constituents of concern, their concentration in the groundwater and the required effluent limitations are listed in the following table:

Contaminate	Untreated influent (ppm)	Effluent requirements (ppb)
1,2-Dichloroethane	0.002-1.2	40
1,1-Dichloroethane	0.002-2.8	57
1,2-Dichloroethene	0.001-0.028	No Limit
Tetrachloroethene	0.026-0.49	132
1,1,1-Trichloroethane	0.001-2.8	No Limit
1,1,2-Trichloroethane	0.003-0.016	No Limit
Trichloroethene	0.008-1.4	40

Operating Criteria:

Average flow	100 gpm
Minimum water temperature	55°F
Minimum air temperature	18°F

1.04 START-UP ASSISTANCE

The manufacturer shall provide one (1) 8-hour day on-site to assist in start-up and training of personnel in the operation of this equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

The unit shall be manufactured by North East Environmental Products or approved equal.

2.02 COMPONENTS

The unit shall consist of a set of perforated trays, sump tank, blower, operating switches and controls all mounted on a steel skid frame. All components shall be suitable for service in outside ambient conditions at the site. Electrical enclosures shall be NEMA 3R or higher, motors shall be TEFC.

2.03 MATERIALS

Trays, demister, and sump tank shall be constructed of 304L stainless steel. The Skid frame shall be constructed of carbon steel.

2.04 FABRICATION

The unit shall be fabricated, tested and painted at the site of manufacture. No fabrication shall be required at the site.

PART 3 - EXECUTION

3.01 EXAMINATION

Examine the unit carefully when it arrives on-site for damage from shipping and loading. Check for spare parts and manuals.

3.02 INSTALLATION

Install the unit in the location shown. Make connections for the feed line, discharge line and power service. Install miscellaneous valves and fittings as required to complete the operational unit as directed by the manufacturer's instructions.

3.03 PROTECTION

Provide clear zone around the unit to prevent accidental hitting, or movement, both at the storage area and after installation.

END OF SECTION

SECTION 15260

PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED SECTIONS

A. Section 02615 - Pressure Pipe - Schedule 40 & 80.

B. Section 02730 - Gravity Pipe (PVC).

1.3 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

D. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

F. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

G. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

H. ASTM E84 - Surface Burning Characteristics of Building Materials.

I. ASTM E96 - Water Vapor Transmission of Materials.

J. NFPA 255 - Surface Burning Characteristics of Building Materials.

K. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Deliver materials to site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of [24] [____] hours.

PART 2 PRODUCTS

2.1 HYDROUS CALCIUM SILICATE

A. Manufacturers:
1. [_____] Model [_____].
2. Other acceptable manufacturers offering equivalent products.
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].

B. Insulation: ASTM C533; rigid molded white; asbestos free.
1. 'K' ('ksi') value: ASTM C177 and C518; 0.44 at 300 degrees F (0.060 at 147 degrees C).
2. Maximum Service Temperature: 1500 degrees F (815 degrees C).
3. Density: 13 lb/cu ft (208 kg/cu m).

C. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

D. Insulating Cement
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. ASTM C449.

2.2 JACKETS

A. Aluminum Jacket: ASTM B209.
   1. Thickness: 0.016 inch
   2. Finish: Embossed.
   3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory applied or field applied.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
   3. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, [pump bodies,] and expansion joints.

D. For insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.

E. Finish insulation at supports, protrusions, and interruptions.

F. For exterior applications, provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

G. For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 HYDROUS CALCIUM SILICATE INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch (mm)	THICKNESS Inch (mm)
A. Above Grade Pressure Pipe		
B. Above Grade Gravity Pipe		
C. Pump Heads		

END OF SECTION

SECTION 15489

SOIL VAPOR EXTRACTION SYSTEM

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

The soil vapor extraction (SVE) system will remove volatile and some semi-volatile organic compounds from vadose zone soils (soil located above ground water) in three designed areas. Vapor extraction wells are installed in the areas of interest and piped into a central header which leads to a vacuum unit. As a vacuum is applied to the site soils, recovered vapors flow through the central header, into the vacuum unit and are then discharged to the atmosphere.

1.02 SUBMITTALS

Submit drawings catalog cut sheets and operating and maintenance data as required in Section 1300.

1.03 JOB CONDITIONS

The performance criteria for the vacuum unit is listed below:

Inlet Capacity	630 ICFM
Inlet Temperature	68°F
Inlet Pressure	10.9" Hg vacuum
Discharge Pressure	14.7 psia
Blower Speed	2000 to 2400 rpm

1.04 START UP ASSISTANCE

The manufacturer shall provide one (1) 8-hour day on-site to assist in start-up and training of personnel in the operations of the vacuum unit. The manufacturer shall also provide three (3) copies of operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MANUFACTURE

The vacuum unit shall be manufactured by Brown and Morrison or approved equal.

2.02 COMPONENTS

The vacuum unit shall consist of a skid mounted blower package to include the following components:

(1) Roots 59 U-RAI Vacuum Blower or Approved Equal

(1) OSHA Standard V-belt Guard

(1) 3" Vacuum Spring Relief valve rated for 1300 CKM at set vacuum of 10 inches of mercury.

(1) 5" Universal Silencer - Separator (condensate tray) capacity 16 gallons with sight gauge. Universal Silencer Model V1-5 or approved equal.

(1) 5" Inlet Air Filter with weather hood with rated capacity of 750 CFM.

(1) 5" In Line Dry Type Filter, Standard Silencers Model F65-5.7

(1) 5" Chamber - absorptive discharge silencer, Universal Silence or approved equal.

(3) Vacuum Gauge, Bourdon type 2½"dial 0-30" Hg vacuum as manufactured by Ashcroft.

(1) Pressure Gauge, Bourdon type 2½"diameter 0-15 psig as manufactured by Ashcroft.

1) Discharge Thermometer 3" dial 50 - 200°F scale.

(1) High Discharge Air Temperature Switch NEMA 7 with thermowell, copper bulb and capillary.

(1) Differential Pressure Switch, explosion proof. Mercoid Model Number PGW-3-1 with adjustable operating range 1-30" water.

(2) 2½"Sponsler Flowmeter explosion proof enclosure.

(1) High liquid level switch for inlet silencer/condensak trap, explosion proof.

(1) Control Panel, explosion proof enclosure, containing the following:

- Across-The-Line Magnetic, pushbutton starter for blower motor, explosion-proof
- Pushbuttons for start-stop
- Run light with contacts for remote
- 24 hour 7 day clock timer

(1) 20 hp, 1750 rpm 3/60/460 volts explosion proof motor and slide base.

(1) Tandem Axle Trailer to transport above stud.

All components shall be suitable for service in outside ambient conditions at the site, and shall be mounted on a steel skid frame. Electrical enclosures shall be rated for Class I Division II or higher. The motor shall be explosive proof.

2.03 MATERIALS

Silencers, piping, filter housing and skid frame shall be constructed of carbon steel.

2.04 FABRICATION

The unit shall be fabricated tested and painted at the site of manufacture. No fabrication shall be required at the site.

PART 3 - EXECUTION

3.01 EXAMINATION

Examine the unit carefully when it arrives on-site for damage from shipping and loading. Check for spare parts and manuals.

3.02 INSTALLATION

Install the unit in the location shown. Make connections for the feed line, discharge line and power service. Install miscellaneous valves and fittings as required to complete the operational unit as directed by the manufacturer's instructions.

3.03 PROTECTION

Provide clear zone around the unit to prevent accidental hitting, or movement, both at the storage area and after installation.

END OF SECTION

SECTION 16111

CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal conduit.

F. Electrical nonmetallic tubing.

G. Flexible nonmetallic conduit.

H. Fittings and conduit bodies.

1.2 RELATED SECTIONS

A. Section 16170 - Grounding and Bonding.

B. Section 16195 - Electrical Identification.

1.3 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.5 - Rigid Aluminum Conduit.

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. ANSI/NFPA 70 - National Electrical Code.

F. NECA "Standard of Installation."

G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

H. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Section 01600.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.7 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing shown on Drawings is approximate unless dimensioned. Route as required to complete wiring system.

D. Where conduit routing is not shown, determine exact routing and lengths required.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch unless otherwise specified.

B. Underground Installations:

1. More than 5 feet from Foundation Wall: Use thickwall nonmetallic conduit.

2. Within 5 feet from Foundation Wall: Use rigid steel conduit

3. Minimum Size: 3/4 inch.

C. Outdoor Locations, Above Grade: Use rigid steel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel.

F. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

G. Do not attach conduit to ceiling support wires.

H. Arrange conduit to maintain headroom and present neat appearance.

I. Route exposed conduit parallel and perpendicular to walls.

J. Route conduit in and under slab from point-to-point.

K. Do not cross conduits in slab.

L. Maintain adequate clearance between conduit and piping.

M. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees.

N. Cut conduit square using saw or pipecutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

Q. Use conduit hubs and seal-off's to fasten conduit to metal boxes or panels.

R. Install no more than equivalent of three 90-degree bends between boxes.

S. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.

T. Provide suitable pull string in each empty conduit except sleeves and nipples.

U. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

V. Ground and bond conduit under provisions of Section 16170.

END OF SECTION

SECTION 16123

WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wire and cable.

B. Nonmetallic-sheathed cable.

C. Underground feeder and branch circuit cable.

D. Service entrance cable.

E. Wiring connectors and connections.

1.2 RELATED SECTIONS

A. Section 16111 - Conduit.

B. Section 16195 - Identification.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years documented experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.6 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper unless indicated as aluminum or "AL".

C. If aluminum conductor is substituted for copper conductor, size to match circuit requirements for conductor ampacity and voltage drop.

D. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route

wire and cable as required to meet Project Conditions.

E. Where wire and cable routing is not shown, determine exact routing and lengths required.

1.7 COORDINATION

A. Determine required separation between cable and other work.

B. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.1 WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THHN.

2.2 NONMETALLIC-SHEATHED CABLE

A. Description: ANSI/NFPA 70, Type NMC.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.3 UNDERGROUND FEEDER AND BRANCH CIRCUIT CABLE

A. Description: ANSI/NFPA 70, Type UF.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 90 degrees C.

2.4 SERVICE ENTRANCE CABLE

A. Description: ANSI/NFPA 70, Type SE.

B. Conductor: Copper

C. Insulation Voltage Rating: 600 volts.

D. Insulation: Type XHHW.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that stored conductors can be protected form the weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

C. Use stranded conductors for control circuits.

D. Use conductor not smaller than 12 AWG for power and lighting circuits.

E. Use conductor not smaller than 16 AWG for control circuits.

F. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

G. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for all conductors.

J. Protect exposed cable from damage.

K. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure.

L. Use suitable cable fittings and connectors.

M. Neatly train and lace wiring inside boxes, equipment, and panelboards.

N. Clean conductor surfaces before installing lugs and connectors.

O. Make taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

P. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

Q. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01007.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 16170

GROUNDING AND BONDING

PART I. GENERAL

1.1 SECTION INCLUDES

A Grounding electrodes and conductors.

B. Equipment grounding conductors.

C Bonding.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 GROUNDING ELECTRODE SYSTEM

A. Metal frame of the building.

B. Rod electrode.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 10 ohms.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01300.

B. Accurately record actual locations of grounding electrodes.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2. PRODUCTS

2.1 ROD ELECTRODE

B. Material: Copper or copper-clad steel.

C. Diameter: 3/4 inch.

D. Length: 10 feet.

2.2 ACTIVE ELECTRODES

A. Substitutions: Under provisions of Section 01300.

2.3 WIRE

A. Material: Stranded copper.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Provide bonding to meet Regulatory Requirements.

D. Provide isolated grounding conductor for circuits supplying programmable logic controllers.

E. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

A. Interface with lightning protection system installed under Section 16670.

3.3 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.3 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Anchors and Fasteners:

1. Concrete Structural Elements: Use expansion anchors.

2. Steel Structural Elements: Use beam clamps, spring steel clips.

3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.

4. Sheet Metal: Use sheet metal screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not drill or cut structural members.

E. Fabricate supports from structural steel or steel channel. Use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

F. Install surface-mounted cabinets and panelboards with minimum of four anchors.

G. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.

H. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 16421

UTILITY SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Arrangement with Utility Company for permanent electric service.

B. Underground service entrance.

C. Metering equipment.

1.2 RELATED SECTIONS

A. Section 16170 - Grounding and Bonding.

B. Section 16426 - Distribution Switchboards.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Utility Company: DUKE POWER COMPANY.

B. System Characteristics: 480 volts, three phase, 60 Hertz.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Utility Company written requirements.

B. Maintain one copy copies of each document on site.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 UTILITY METERS

A. Meters will be furnished by Utility Company.

2.2 UTILITY METER BASE

A. Meter base will be furnished by Utility Company.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that service equipment is ready to be connected and energized.

3.2 PREPARATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Coordinate location of Utility Company's facilities to ensure proper access is available.

3.3 INSTALLATION

A. Install service entrance conduits from Utility Company's terminal pole meter base. Connect service entrance conductors at meter base.

END OF SECTION

SECTION 16426

DISTRIBUTION SWITCHBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Distribution switchboard.

1.2 RELATED SECTIONS

A. Section 16421 - Utility Service Entrance: Utility metering equipment.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. ANSI/IEEE C12.1 - Code for Electricity Metering.

C. ANSI C39.1 - Electrical Analog Indicating Instruments.

D. ANSI C57.13 - Instrument Transformers.

E. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

F. NEMA KS 1 - Enclosed Switches.

G. NEMA PB 2 - Deadfront Distribution Switchboards.

H. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit to OWNER under provisions of Section 01300.

B. Maintenance Data: Include spare parts data listing; source of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept switchboards on site. Inspect for damage.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.9 MAINTENANCE MATERIALS

A. Provide maintenance materials.

1.10 EXTRA MATERIALS

A. Provide one of each size circuit breaker required.

PART 2 PRODUCTS

2.1 SWITCHBOARD

A. Main Section Devices: Panel mounted.

B. Distribution Section Devices: Panel mounted.

C. Bus Material: Copper standard size.

D. Bus Connections: Bolted accessible from rear only for maintenance.

E. Fully insulate load side bus bars in rear accessible compartments

F. Ground Bus: Extend length of switchboard.

G. Fusible Switch Assemblies: NEMA KS 1, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses, type as specified.

H. Molded Case Circuit Breakers: NEMA AB 1, integral thermal and instantaneous magnetic trip in each pole.

I. Line and Load Terminations: Accessible from the rear of the switchboard, suitable for the conductor materials and sizes indicated.

J. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

K. Enclosure: Type NEMA-4

1. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

2. Mimic Bus: Show bussing, connections and devices in single line form on the front panels of the switchboard using black color factory painting fastened flat against the panel face with screws or rivets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for switchboard installation.

3.2 PREPARATION

A. Provide concrete housekeeping pad.

3.3 INSTALLATION

A. Install switchboard in locations shown on Drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

3.4 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each, at test voltage of 1000 volts; minimum acceptable value for insulation resistance is 2 megohms.

C. Check tightness of accessible bolted bus joints using calibrated torque wrench.

D. Physically test key interlock systems to insure proper function.

3.5 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

3.6 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 16476

ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed circuit breakers.

1.2 RELATED WORK

A. Section 16190 - Supporting Devices.

B. Section 16195 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers

C. NFPA 70 - National Electrical Code.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 3 years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MOLDED CASE CIRCUIT BREAKER

A. Circuit Breaker: NEMA AB 1.

2.2 TRIP UNITS

A. Field-Changeable Ampere Rating Circuit Breaker: Provide circuit breakers with frame sizes 200 amperes and larger with changeable trip units.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.

B. Install enclosed circuit breakers plumb. Provide supports in accordance with Section 16190.

3.2 FIELD QUALITY CONTROL

A. Inspect and test each circuit breaker to NEMA AB 1.

B. Inspect each circuit breaker visually.

C. Perform several mechanical ON-OFF operations on each circuit breaker.

D. Verify circuit continuity on each pole in closed position.

E. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements.

END OF SECTION

SECTION 16481

ENCLOSED MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Magnetic motor starters.

B. Combination magnetic motor starters.

1.2 RELATED SECTIONS

A. *Section 16195 - Electrical Identification: Engraved nameplates.*

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NECA "Standard of Installation," published by National Electrical Contractors Association.

C. NEMA AB 1 - Molded Case Circuit Breakers.

D. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

E. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

F. NEMA KS 1 - Enclosed Switches.

1.4 SUBMITTALS

A. Submit to OWNER under provisions of Section 01300.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUAL CONTROLLERS

A. Motor Starting Switch:

B. Enclosure: NEMA ICS 6; Type 4.

2.2 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Coil operating voltage: 120 volts, 60 Hertz.

C. Overload Relay: NEMA ICS; bimetal.

D. Enclosure: NEMA ICS 6, Type 4.

2.3 PRODUCT OPTIONS AND FEATURES

A. Auxiliary Contacts: NEMA ICS 2, 2 each field convertible contacts in addition to seal-in contact.

B. Pilot Device Contacts: NEMA ICS 2, Form Z, rated A150.

C. Pushbuttons: Lockable type

D. Control Power Transformers: 120 volt secondary, 150 va minimum, in each motor starter. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

2.4 DISCONNECTS

A. Combination Controllers: Combine motor controllers with thermal magnetic circuit breaker, non-fusible switch disconnect in common enclosure.

B. Nonfusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Install enclosed controllers plumb. Provide supports in accordance with Section 16190.

C. Height: 5 ft to operating handle.

D. Select and install overload heater elements in motor controllers to match installed motor characteristics.

E. Provide engraved plastic nameplates under the provisions of Section 16195.

F. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

3.2 FIELD QUALITY CONTROL

A. Inspect and test each enclosed controller to NEMA ICS 2.

END OF SECTION

SECTION 16855

HEATING CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Heating cable.

B. Temperature controllers for heating cable.

1.2 PERFORMANCE REQUIREMENTS

A. Pipe Trace Heating: Freeze protection with outside temperature at 40 degrees F.

1.3 SUBMITTALS

A. Shop Drawings: Indicate heating cable layout, locations of terminations, thermostats, and branch circuit connections.

B. Product Data: Provide data for heating cable, and control components.

C. Manufacturer's Installation Instructions: Indicate installation instructions.

1.4 PROJECT RECORD DOCUMENTS

A. Submit to OWNER under provisions of Section 01300.

B. Accurately record actual locations of heating cable, temperature sensors, thermostats, and branch circuit connections.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01300.

B. Operation Data: Include description of operating controls.

C. Maintenance Data: Include repair methods and parts list of components.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 3 years documented experience.

1.7 COORDINATION

A. Coordinate installation of heating cable with installation of piping, and piping insulation.

PART 2 PRODUCTS

2.1 HEATING CABLE

A. Heating Cable: Thermoplastic-insulated, parallel resistance heating cable.

B. Rating: 120 Volts.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping is ready to receive work.

B. Verify field measurements are as shown on shop drawings.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bending Radius: Six times cable diameter, minimum.

C. Avoid pinching and making sharp bends in cable.

D. Prevent damage by sharp rocks, metal, or other objects during installation.

E. Do not install heating cable across expansion or construction joints.

F. Do not cross heating cable over itself.

3.3 FIELD QUALITY CONTROL

A. Test continuity of heating cable.

B. Measure insulation resistance to manufacturer's recommended values. Use test instruments in accordance with manufacturer's instructions.

C. Perform continuity and insulation resistance test on completed cable installation. For cables embedded in concrete, perform tests immediately before and after concrete placement.

D. Measure voltage and current at each unit.

E. Submit written test report showing values measured on each test for each cable.

3.4 DEMONSTRATION

A. Demonstrate operation of heating cable controls.

END OF SECTION

INSTRUMENTATION SPECIFICATIONS

CLIENT:	NO.	BY	DATE	REVISION	SHEET 1 OF 1
MEDLEY FARMS	A	VPM	5-26-93	CLIENT REVIEW	
GAFFNEY, SC					SPEC. NO. FIT-101A
					CONTRACT 938.11
					DATE
	BY	CHK'D	E&I APRV	PIPING APRV	
FLOW INDICATING TRANSMITTERS	VPM				REQ.-P.O.

MANUFACTURER: ERDCO

MODEL NO.: 3600

TYPE: ARMOR-FLO METER

HOUSING: ALUMINUM

TUBE: STEEL

SIZE: 2"

FLOW RANGE: 6-60 GPM

OUTPUT: 4-20 mA = 6-60 GPM

PROCESS CONN.: 2" 150# FLANGE

ENCLOSURE: NEMA 4

ELECTRICAL CONN.: 3/4" NPT CONDUIT

POWER REQUIRED: 120V AC, 60 HZ

TAG NO.S: FIT-101A
FIT-102A
FIT-103A
FIT-104A
FIT-105A
FIT-106A
FIT-107A
FIT-201A
FIT-202A
FIT-203A
FIT-204A

PROCESS DATA:

FLUID:	WATER
FLOW:	30 GPM NORMAL, 50 GPM MAXIMUM
TEMP.:	AMBIENT
PRESS.:	160 PSIG

NOTES:
1. FURNISH 7 SETS OF MAINTENANCE MANUALS, PARTS LIST, AND INSTRUCTIONS.
2. FURNISH AND ATTACH SS TAGS AT THE FACTORY.

CLIENT:	NO.	BY	DATE	REVISION	SHEET 1 OF 1
MEDLEY FARMS	A	VPM	5-26-93	CLIENT REVIEW	
GAFFNEY, SC					SPEC. NO. FIT-101B
					CONTRACT 938.11
					DATE
	BY	CHK'D	E&I APRV	PIPING APRV	
FLOW INDICATING TRANSMITTERS	VPM				REQ.-P.O.

MANUFACTURER: ERDCO

MODEL NO.: 3600

TYPE: ARMOR-FLO METER

HOUSING: ALUMINUM

TUBE: STEEL

SIZE: 2"

FLOW RANGE: 8-80 GPM

OUTPUT: 4-20 mA = 8-80 GPM

PROCESS CONN.: 2" 150# FLANGE

ENCLOSURE: NEMA 4

ELECTRICAL CONN.: 3/4" NPT CONDUIT

POWER REQUIRED: 120V AC, 60 HZ

TAG NO.S:
FIT-101B
FIT-102B
FIT-103B
FIT-104B
FIT-105B
FIT-106B
FIT-107B
FIT-201B
FIT-202B
FIT-203B
FIT-204B

PROCESS DATA:

FLUID:	WATER
FLOW:	42 GPM NORMAL, 70 GPM MAXIMUM
TEMP.:	AMBIENT
PRESS.:	55 PSIG

NOTES:
1. FURNISH 7 SETS OF MAINTENANCE MANUALS, PARTS LIST, AND INSTRUCTIONS.
2. FURNISH AND ATTACH SS TAGS AT THE FACTORY.

CLIENT:	NO.	BY	DATE	REVISION	SHEET 1 OF 1
MEDLEY FARMS	A	VPM	5-17-93	CLIENT REVIEW	
GAFFNEY, SC					SPEC. NO. PI-100
					CONTRACT 938.11
					DATE
PRESSURE GAGES	BY VPM	CHK'D	E&I APRV	PIPING APRV	REQ.-P.O.

1	Type	3-15lb Rec'vr		Direct Rdg.	X			Other	
2	Mounting	Surface		Local	X	Flush		Other	BOTTOM STEM
3	Dial	Diameter	4 1/2"	Color	BLACK LETTERS ON WHITE BACKGROUND				
4	Case	Phenolic	X	Aluminum		Steel		Other	
5	Ring	Screwed	X	Hinged				Other	
		Slip		Standard					
6	Blowout Protection	None		Back				Other	
		Solid Front	X	Disc.					
7	Lens	Glass		Plastic	X				
8	Options	Siphon		Snubber		Pressure Limit Valve			
		Siphon Matl				Movement Damping		SILICONE FILLED	
9	Accuracy	Nom.Required	+/- 0.5%						
10	Manufacturer		ASHCROFT						
	Model Number		1279SSL						
11	Press. Element	Bourdon	X	Bellows				Other	
12	Element Matl	Bronze		Steel				Other	316 SS
13	Socket Matl	Bronze		Steel				Other	316 SS
14	Connection-NPT	0.25 in		0.50 in	X			Other	
15	Movement	Bronze		Steel		Nylon		Other	316 SS
16	Diaphragm Seal	MFG.		Type		Abeolute			
		Fill Fluid				Wetted Matl.		Other	
		Process Conn.		Gage Conn.					

Rev.	Quan.	Tag Number	Range	Oper.Press	P&ID Number	Service
A	1	PI-100	0-200 PSIG	130 - 160 PSIG	938-C04	PUMP P-100 DISCHARGE
A	1	PI-200	0-200 PSIG	130 - 160 PSIG	938-C04	PUMP P-200 DISCHARGE
A	1	PI-101	0-200 PSIG	130 - 160 PSIG	938-C04	WELL A1
A	1	PI-102	0-200 PSIG	130 - 160 PSIG	938-C04	WELL A2
A	1	PI-103	0-200 PSIG	130 - 160 PSIG	938-C04	WELL A3
A	1	PI-104	0-200 PSIG	130 - 160 PSIG	938-C04	WELL A4
A	1	PI-105	0-200 PSIG	130 - 160 PSIG	938-C04	WELL A5
A	1	PI-106	0-200 PSIG	130 - 160 PSIG	938-C04	WELL A6
A	1	PI-107	0-200 PSIG	130 - 160 PSIG	938-C04	WELL A7
A	1	PI-108	0-160 PSIG	30 - 130 PSIG	938-C04	TURNAROUND MANHOLE
A	1	PI-201	0-200 PSIG	130 - 160 PSIG	938-C04	WELL B1
A	1	PI-202	0-200 PSIG	130 - 160 PSIG	938-C04	WELL B2
A	1	PI-203	0-200 PSIG	130 - 160 PSIG	938-C04	WELL B3
A	1	PI-204	0-200 PSIG	130 - 160 PSIG	938-C04	WELL B4
A	1	PI-205	0-200 PSIG	30 - 130 PSIG	938-C04	TURNAROUND MANHOLE

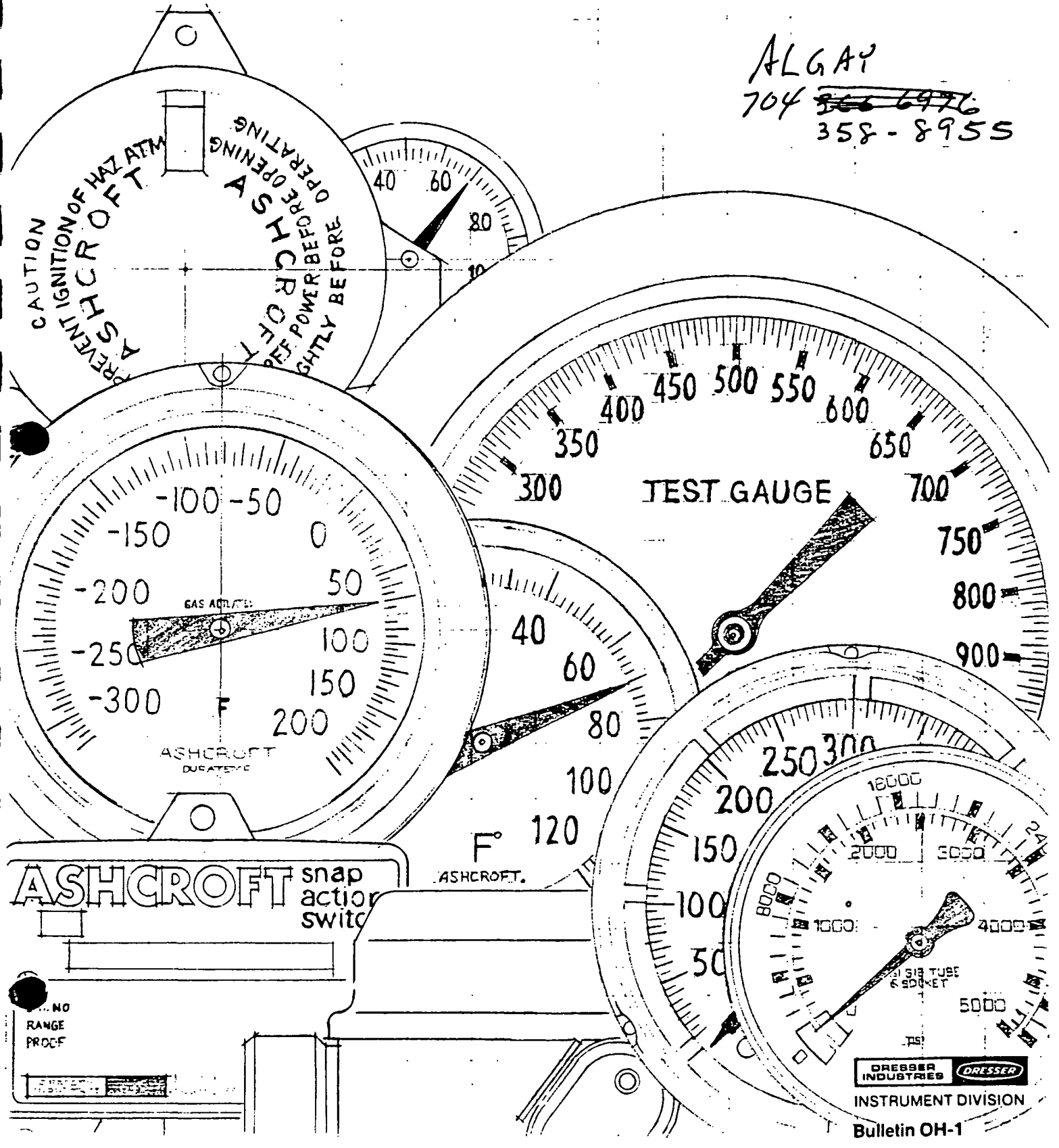
NOTES:

1. Supply 7 sets of maintenance manuals, parts list, & instructions.
2. Supply & attach SS tags at the factory.

ASHCROFT®

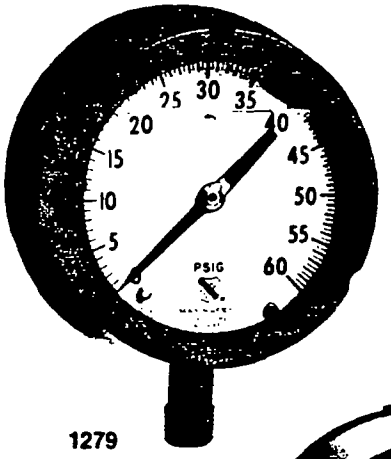
Pressure, Temperature, Control Instrument Ordering Handbook

ALGAY
704 ~~366 6976~~
358-8955

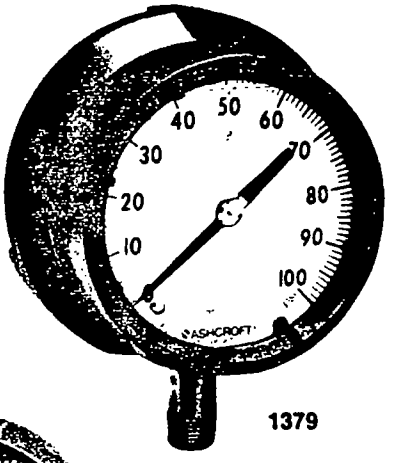


DRESSER INDUSTRIES DRESSER
INSTRUMENT DIVISION

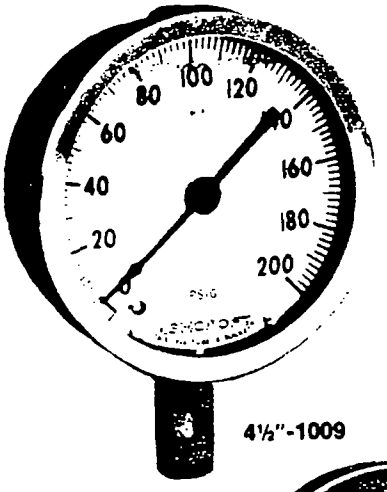
Bulletin OH-1



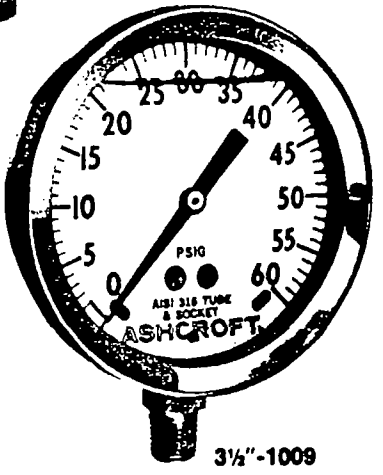
1279



1379



4½"-1009



3½"-1009

Under adverse environmental conditions, corrosive elements can attack gauge internals and shorten gauge service life. Severely vibrating and pulsating machinery and other equipment on which gauges are installed may cause rapid wear in the gear teeth or bearings of a gauge movement.

Liquid filling a gauge prevents corrosive effects caused by adverse environments. Constant lubrication is provided by complete immersion of the gauge movement in the filling liquid, protecting the movement from vapors, dust, and corrosive elements. Liquid filling also minimizes wear on all moving gauge parts. The liquid, usually glycerine or silicone, acts as a dampening agent for the sensing element and movement, and pointer flutter is reduced to a level which allows easy reading. Gauge service life, therefore, is extended even under severe atmospheric pulsating or vibrating service conditions.

Liquid filled gauges are especially suited to applications on pumps, compressors, and hydraulic equipment, whether in offshore installations, chemical plants, pulverized fuel plants, pulp and paper mills, or utilities. Ashcroft liquid filled gauges are available in ranges from vacuum to 20,000 psi; in dial sizes up to 6"; in aluminum, stainless steel and phenolic cases; with lower or back connections.

The 4½" Type 1279 phenolic case and 4½" and 6" Type 1379 aluminum case gauges are available in a solid front construction. They have a rear elastomeric diaphragm, which acts as a pressure relief back, compensating for internal case pressure changes caused by changes in ambient temperature. Open front case Type 1009 has a fill pressure relief plug which relieves internal case pressure in the event a slow leak develops in the pressure element. All sizes are offered for stem, surface, or flush mounting.

The advantages of liquid filling complement those of the sensing element and movement, proven in years of Ashcroft gauge service. Bourdon tubes are designed, manufactured, and tested for extreme cycle life, calibration stability, and corrosion resistance. Movements are designed and materials selected to provide minimal friction and long wear life.

These features — plus a selection of Bourdon tube system materials — assure that an Ashcroft liquid filled gauge line will provide outstanding gauge value and service in filled gauge applications.

For additional information refer to Bulletin LF-1

Type 1009

Dial Sizes	2½" and 3½"
Case	Stainless Steel
Ring	Stainless Steel, Bayonet Type
Connection	¼" NPT Lower or Back
Mounting	Stem, Surface, or Flush
Window	Polycarbonate
Dial	Brushed Aluminum
Pointer	Friction Adjustable
Bourdon Tube	Bronze, Stainless Steel
Movement	Stainless Steel
Accuracy	ANSI B40.1 Grade 1A (1%)
Gasket	Neoprene
Filler Plug	Viton
Sealant	RTV
Ranges	Vacuum to 15,000 psi

Type 1009

Dial Size	4½" & 6"
Case Size	Stainless Steel
Ring	Stainless Steel, Bayonet Type
Connection	½" NPT Lower or Back
Mounting	Stem, Surface, or Flush
Window	Polycarbonate
Dial	Brushed Aluminum
Pointer	Adjustable, Black Aluminum
Bourdon Tube	Bronze, Steel, Stainless Steel, Monel
Movement	Stainless Steel with Bronze Pinion & Segment Shaft
Accuracy	ANSI B40.1 Grade 1A (1%)
Gasket	Neoprene
Filler Plug	Viton
Sealant	RTV
Ranges	Vacuum to 20,000 psi

Type 1279

Dial Size	4½"
Case	Phenolic Turret, Black, Solid Front
Ring	Glass Filled Polypropylene, Threaded
Connection	½" NPT Lower or Back
Mounting	Stem, Surface, or Flush
Window	Acrylic Plastic
Dial	White Aluminum
Pointer	Micrometer Adjustable, Black Aluminum
Bourdon Tube	Bronze, Steel, Stainless Steel, Monel
Movement	Stainless Steel
Accuracy	ANSI B40.1 Grade 2A (0.5%)
"O" Ring (Window and Socket)	Buna-N
Rear Elastometric Diaphragm	Buna-N
Ranges	Vacuum to 20,000 psi

Type 1379

Dial Size	4½" & 6"
Case	Aluminum, Black, Solid Front
Rings	Glass Filled Polypropylene, Threaded
Connection	½" NPT Lower or Back
Mounting	Stem, Surface, or Flush
Window	Acrylic Plastic
Dial	White Aluminum
Pointer	Micrometer Adjustable, Black Aluminum
Bourdon Tube	Bronze, Steel, Stainless Steel, Monel
Movement	Stainless Steel
Accuracy	ANSI B40.1 Grade 2A (0.5%)
"O" Ring (Window and Socket)	Buna-N
Rear Elastometric Diaphragm	Buna-N
Ranges	Vacuum to 20,000 psi

All gauges are temperature compensated. The Types 1279 and 1379 utilize a flexible, elastomeric back and the Type 1009 a thin, flexible, plastic window. The action of each is to minimize the error created by changes in ambient temperature.

NOTE: Throttle screws are supplied as standard on all liquid filled gauges.

To Order A Gauge: 4½" 1279 S SL Glycerine 0/1000 Stem/Lower ½"

Select:
1. Dial Size — Table A
2. Case Type: include suffix L: 1009(*)L, 1279(*)SL, Table A
3. Bourdon Tube System — Table B
4. Liquid Fill — Table C
5. Pressure Range — Table D
6. Mounting Accessory or Variation (if required) Table A
7. *Connection :*
   Location — Table A
   Size — Table B

TABLE A — CASE SELECTION

Case Type Number	Dial Size (Inches)	Case: Style	Case: Material Finish	Ring: Style Material Finish	Mounting and Connection
1279(*)SL	4½	Solid Front	Phenolic Black	Threaded (Reinforced) Polypropylene Black	Stem — Lower or Back Surface — Lower or Back Flush — Back: Order 1278 M Ring
1379(*)SL	4½, 6	Solid Front	Aluminum Black	Threaded (Reinforced) Polypropylene Black	Stem — Lower or Back Surface — Lower or Back Flush — Back — Order 1278 M ring (See page 60)
1009(*)L	2½, 3½ 4½, & 6	Open Front	Stainless Steel Polished	Bayonet Lock Stainless Steel Polished	Stem — Lower or Back Surface — Lower Wall Mounting Bracket: Specify XBF Black Flange (2½" & 3½"): Specify XFW Surface — Back Back Flange (2½" & 3½"): Specify XFW Flush — Back Front Flange: Specify XFF. (not 6") U-Clamp: Specify XUC

(*) Bourdon tube ordering code from Table B.
NOTE: IF 63 or 100mm size gauges are required see Type 1008 Gauges.

TABLE B — BOURDON SYSTEM SELECTION

Ordering Code	Bourdon Tube and Tip Material (all joints TIG welded except "A")	Socket Material	Range Tube Type	Selection Limits (psi)	NPT Connection (1)
A	Grade A Phosphor Bronze Tube — Brass Tip, Silver Brazed	Brass	Drawn C-Tube	12/1000	
B	AISI 4130 alloy steel	AISI 1019 steel(2)	Drawn C-Tube	15/1500	½
			Drawn Helical	2000/5000	
R	AISI 316 stainless steel	AISI 1019 steel	Drawn C-Tube	15/1500	½
			Drawn Helical	2000/20,000	
S	AISI 316 stainless steel	AISI 316 stainless steel	Drawn C-Tube	12/1500	½
SW(3)			Drawn Helical	2000/20,000	
P	K Monel	Monel 400	Drawn C-Tube	15/1500	½
			Drawn Helical	2000/20,000	

(1) Optional connections available: ¼ NPT where ½ NPT is standard. 2½" & 3½" Type 1009 — ¼ NPT only.
(2) Socket for 2½" Type 1009 is brass. Socket/tube is silver brazed.
For additional information refer to Bulletin LF-1.
(3) 2½ & 3½ 1009 SW only.

Table C — Recommended Ambient Temperature Operating Range Limits

	°F	°C
Glycerine filled	0/150	-18/65
Silicone oil filled	-50/150	-45/65
Halocarbon filled	-70/150	-57/65

Glycerine or silicone should not be used in applications involving strong oxidizing agents such as Oxygen, Chlorine, Nitric Acid, or Hydrogen Peroxide, because of danger of spontaneous chemical reaction, ignition or explosion: — Halocarbon should be specified.

In applications of 4½" and 6" stem mounted liquid filled gauges where vibration is extremely severe (over 5 g's), ¼NPT connections should be used to prevent possibility of failure of socket or associated piping caused by vibrating weight of a liquid filled gauge.

Table D

Standard Ranges

pressure (psi)		
range	figure interval	minor graduation
0/15	1	0.2
0/30	5	0.5
0/60	5	1
0/100	10	1
0/160	20	2
0/200	20	2
0/300	50	5
0/400	50	5
0/600	50	10
0/800[1]	100	10
0/1000	100	10
0/1500	200	20
0/2000	200	20
0/3000	500	50
0/5000	500	50
0/10,000	1000	100
0/20,000[2]	2000	200

compound and combination								
range			figure interval			minor graduation		
psi	inches mercury	feet water	psi	inches mercury	feet water	psi	inches mercury	feet water
15	30	—	3	5	—	0.5	1	—
30	30	—	5	10	—	0.5	1	—
60	30	—	10	10	—	1	1	—
100	30	—	10	10	—	1	1	—
150	30	—	20	10	—	2	2	—
300	30	—	25	30	—	5	5	—
15	—	34	3	—	5	0.5	—	1
30	—	70	5	—	10	1	—	1
60	—	140	5	—	20	1	—	2
100	—	230	10	—	20	1	—	5
160	—	370	20	—	50	2	—	5
200	—	460	20	—	50	5	—	5
300	—	690	25	—	50	5	—	10

retard		
dial size (inches)	range	
4½	0/10 psi retard to 30 psi 0/20 psi retard to 60 psi 0/40 psi retard to 100 psi	30" Hg Vac/75 psi retard to 150 psi 10" Hg Vac/5 psi retard to 30" Hg Vac and to 30 psi

Accuracy (ANSI B40.1) —
Type 1279 Grade 2A — (0.5%)
Type 1009 Grade 1A — (1%)

vacuum		
range	figure interval	minor graduation
30-0 inches Mercury	5 inches	0.5 inch

(1) Not available in 2½" and 3½" Type 1009A.
(2) 4½" size only.

Standard Metric Ranges

RANGE		DIAL GRADUATIONS		RANGE	DIAL GRADUATIONS		Outer scale
kg/cm² (Kilograms per sq. cm.)	bar	figure interval	minor graduation	kPa (kilopascal)	figure interval	minor graduation	when dual range specified psi
pressure							
0/1	0/1	0.1	0.01	0/100	10	1	0/14
0/1.6	0/1.6	0.2	0.02	0/160	20	2	0/22
0/2.5	0/2.5	0.5	0.05	0/250	50	5	0/35
0/4	0/4	0.5	0.05	0/400	50	5	0/55
0/6	0/6	0.5	0.1	0/600	50	10	0/85
0/10	0/10	1	0.1	0/1000	100	10	0/140
0/16	0/16	2	0.2	0/1600	200	20	0/220
0/25	0/25	5	0.5	0/2500	500	50	0/350
0/40	0/40	5	0.5	0/4000	500	50	0/550
0/60	0/60	5	1	0/6000	500	100	0/850
0/100	0/100	10	1	0/10 000	1000	100	0/1400
0/160	0/160	20	2	0/16 000	2000	200	0/2200
0/250	0/250	50	5	0/25 000	5000	500	0/3500
0/400	0/400	50	5	0/40 000	5000	500	0/5500
0/600	0/600	50	10	0/60 000	5000	1000	0/8500
0/1000	0/1000	100	10	0/100 000	10 000	1000	0/14,000
vacuum							
-1/0	-1/0	0.1	0.01	-100/0	10	1	30" Hg/o
compound							
-1/0/1.5	-1/0/1.5	0.5	0.05	-100/0/150	50	5	30" Hg/0/20
-1/0/3	-1/0/3	0.5	0.05	-100/0/300	50	5	30" Hg/0/40
-1/0/5	-1/0/5	0.5	0.1	-100/0/500	50	10	30" Hg/0/70
-1/0/9	-1/0/9	1	0.1	-100/0/900	100	10	30" Hg/0/125
				-100/0/1500	200	20	30" Hg/0/215
				-100/0/2400	500	20	30" Hg/0/340

CLIENT:	NO.	BY	DATE	REVISION	SHEET 1 OF 1
MEDLEY FARMS	A	VPM	5-26-93	CLIENT REVIEW	
GAFFNEY, SC					SPEC. NO. LIT-100
					CONTRACT 938.11
					DATE
	BY	CHK'D	E&I APRV	PIPING APRV	REQ.-P.O.
LEVEL INSTRUMENTS (Capacitance Type)	VPM				

GENERAL	1	Tag Number	LIT-100			
		P & ID Number	938-C04			
	2	Service	WATER			
	3	Line No./Vessel No.	RECIRC. TANK T-1			
	4	Application	LIQUID LEVEL			
	5	Function	INDICATE/TRANSMIT			
	6	Fail-Safe				
PROBE	7	Model Number	41-5029-120			
	8	Orientation	VERTICAL			
	9	Style	RIGID PROBE			
	10	Material	TFE COATED STEEL			
	11	Sheath				
	12	Insertion Length	120 INCHES			
	13	Inactive Length	6 INCHES AT TOP			
	14	Gland Size & Matl.				
	15	Process Conn. & Matl.	3/4" NPT 316 SS			
	16	Conduit Connection	3/4" NPT			
		Tag Number	LE-100			
AMPL	17	Location	REMOTE			
	18	Enclosure	NEMA 4X			
	19	Conduit Connection	1/2" OR 1" NPT			
	20	Power Supply	120 VAC, 60 HZ			
SWITCH	21	Type				
	22	Quantity & Form				
	23	Rating: VOLTS | HZ or DC	|	|	|	|
	24	Amps/Watts/HP				
	25	Load Type				
	26	Contacts Open or Close				
	27	on Level Incr. or Decr.				
TRANS	28	Output	4 - 20 mA DC			
	29	Range/units	0 - 120 INCHES			
		Calib.Span/units	0 - 114 INCHES			
	30	Enclosure Class	NEMA 4X			
OPTIONS	31	Compensation Cable				
	32	Local Indicator				
	33	I/P Transducer				
	34	Signal Lights				
	35					
SERVICE	36	Upper Fluid				
	37	Dielectric Constant				
	38	Lower Fluid	WATER			
	39	Dielectric Constant				
	40	Pressure MAX | NORMAL	ATMOS./G | 0-5 PSIG	|	|	|
	41	Temp. MAX | NORMAL	100 F | 70 F	|	|	|
	42	Moisture				
	43	Material Buildup	NO			
	44	Vibration	MINIMAL			
	45	Manufacturer	MAGNETROL			
	46	Model Number	82-5021-310			

NOTES:

1. Supply 7 sets of maintenance manuals, parts list, & instructions.
2. Supply & attach SS tags at the factory.
3. Provide this probe with reference ground wire for use in FRP tank.

Magnetrol

Kotron™ Series 82 R.F. Level Transmitter

ISO 9001 • Z299.1 REGISTERED ASSURED QUALITY & SERVICE COST LESS

Magnetrol's Series 82 is a microprocessor-based R.F. capacitance level transmitter that offers precise level sensing to the industrial user. Calibration is made easy by the use of push button data entry. The Series 82 features advanced Pulsatel® circuitry to provide effective level control with control room convenience. Kotron transmitters utilize extremely high radio frequency circuitry to minimize the effect of media buildup on the sensing probe.

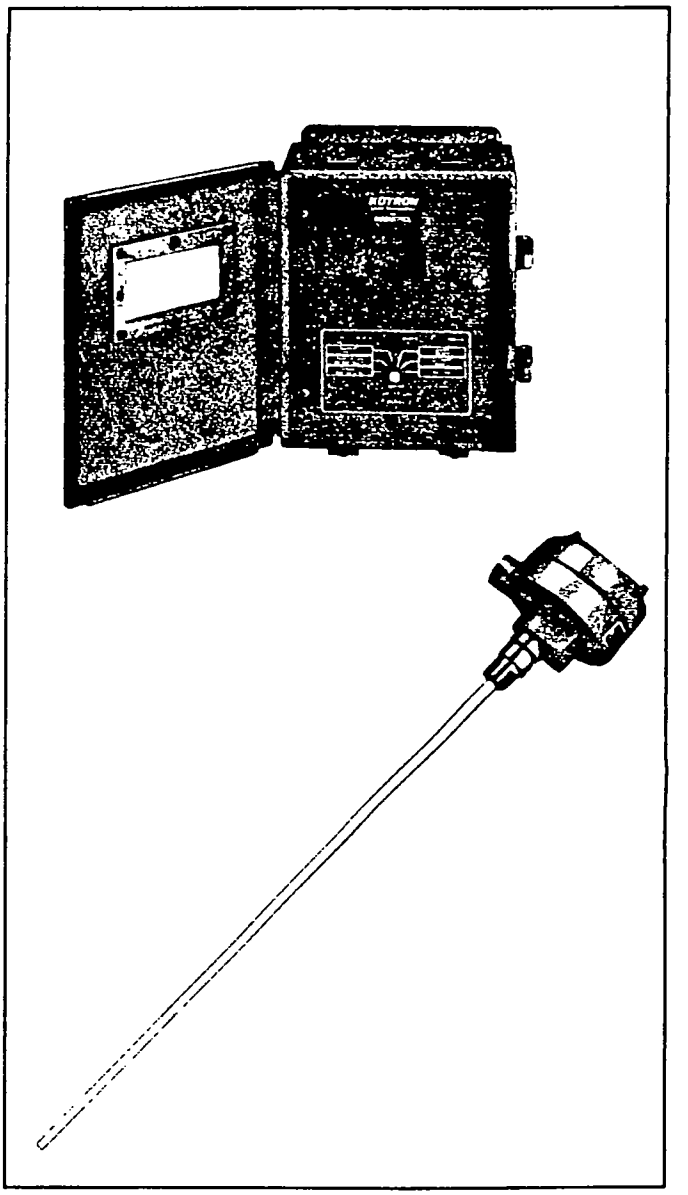
Features

- Microprocessor-based electronics offer simplified push button calibration.
- Pulsatel circuitry allows up to 5000 feet (1524 M) between the sensing probe located in a hazardous environment, and the transmitter safely mounted in a control room.
- Wide span range of 10 to 15,000 pF allows use in almost any media.
- Rigid and flexible sensing probes to 1000°F (538°C) and 5000 psi (345 bar).
- Probe lengths from 6 inches (15.24 cm) to 150 feet (45 M).
- Up to three relays for sophisticated alarm/control requirements.
- 0 - 15 second adjustable time delay.
- Output options include:
  4-20 mA
  0-1 mA
  0 to –10 VDC
- RS-232C/422A output may be added to standard output.
- Blind, analog or digital meter scaled to read 0-100%.
- CSA and FM listed models for non-hazardous environments.

Applications

- Clean or Dirty Liquids
- Light Slurries
- Viscous Liquids
- Food & Beverage
- Hydrocarbons & Solvents
- High Temperature/Pressure Liquids
- Chemicals
- Acids & Salts
- Powders & Granulars

Kotron Series 82 R.F. Level Transmitter



The complete level specialist

Principle of operation

The amount of capacitance developed in any vessel is determined by the surface area of the probe, the distance from the probe to its ground, and the dielectric of the medium it is measuring.

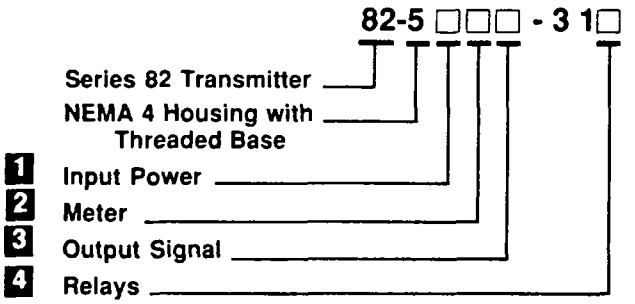
Considering that the probe's mounting position is fixed, and the dielectric value of the medium is constant, then the amount of capacitance developed in any vessel becomes dependent upon the probe's total surface area. A probe's diameter and length determine its surface area. Adjusting the combination of the probe's diameter and length (and of course its proximity to ground) in any given application, can generate the necessary capacitance required by the electronic circuitry.

As medium rises and falls in the tank, the amount of capacitance developed between the sensing probe and the ground also rises and falls. This change in capacitance is sensed by the electronics which changes the capacitance signal to a variable frequency. This signal can then be sent to the main electronics located up to 5000 feet (1500 M) away via standard shielded, twisted pair cable. This eliminates the 150 foot (45 M) maximum distance limitation using costly coaxial or triaxial cables utilized by other manufacturers.

Selection data

Kotron System 82 capacitance level transmitters are identified by a numeric part numbering system. The part number provides exact specification of unit configuration, materials and other options vital to the performance and function of the instrument.

The system is comprised of a transmitter part number (shown below), and a probe assembly (ordered separately from Bulletin 50-125).



1 Input Power

Description	Code
120 VAC	0
240 VAC	1
24 VDC	2

2 Meter

Description	Code
Blind	0
Analog Meter	1
Digital Meter	2

3 Output Signal

Description	Code
4-20 mA, 0-1 mA, and 0 to –10 VDC	1
RS-232C/422A added to the outputs listed under Code 1	2

4 Relays

Description	Code
None	0
3 DPDT 10 amp relays	3

Electrical specifications

Description		Specification
Supply Voltage		120 VAC, 50/60 Hz 240 VAC, 50/60 Hz 24 VDC
Power Consumption		15 Watts Maximum
Zero Range		0 pF (Minimum) 10,000 pF (Maximum)
Span Range		10 pF (Minimum) 15,000 pF (Maximum)
Relay Differential		Adjustable, 2% Minimum
Output Relays	AC	(3) DPDT 120/240 VAC, 10 amp Non-Ind
	DC	(3) DPDT 24 VDC, 0.50 Resistive
Output Signal		4-20 mA, 0-1 mA or 0 to –10 VDC
		4-20 mA, 0-1 mA or 0 to –10 VDC with RS-232C/422A
Time Delay		0-15 seconds
Response Time		100 milliseconds
Repeatability		± 1%
Ambient Temp (Electronics)	Analog	–40°F to +160°F (–40°C to +71°C)
	Digital	–20°F to +160°F (–29°C to +71°C)
Operating Pressure		Dependent upon probe selection. Refer to Probe Bulletin 50-125.
Temperature Coefficient of Output		+0.02 pF per degree F (+0.036 pF per degree C)

Agency approvals

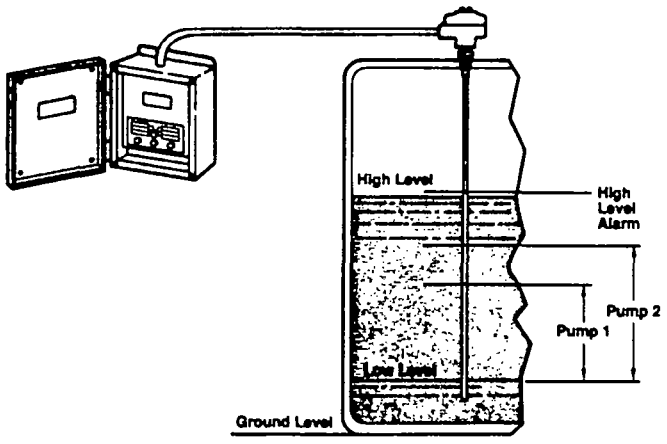
Agency	Model No.	Approval
CSA	All Models	CSA Enc. 4 Non-Hazardous environments
FM	All Models	NEMA 4 Enc. Non-Hazardous environments

Probe assemblies

A full range of rigid and flexible probes for conductive and non conductive materials is available in various lengths and materials of construction. For further information on probe assemblies, please refer to Bulletin 50-125. Be sure to order a 41-5000 Series probe with a threaded housing connection. 41-1000 Series probes with a slip on housing connection are not compatible with this transmitter's probe assembly base.

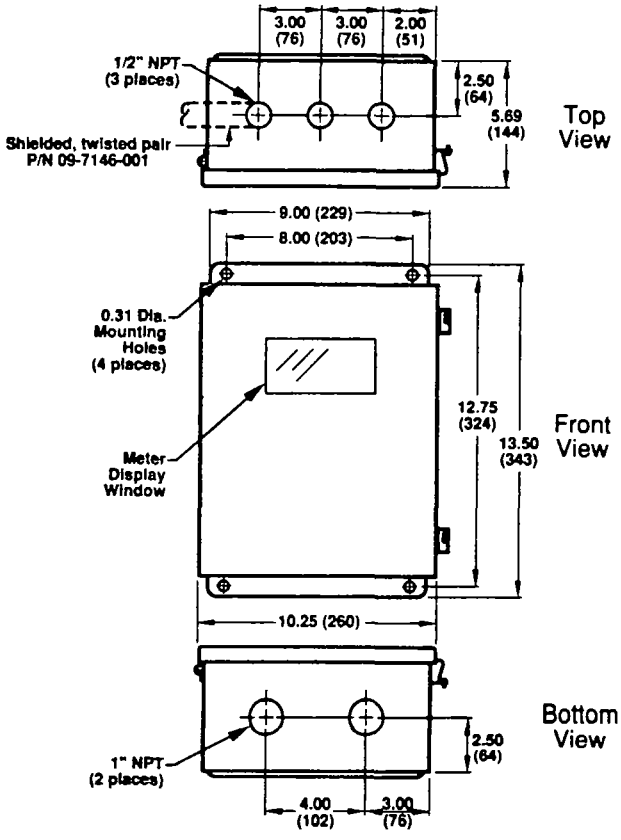
Typical application

The Series 82 offers a comprehensive level control approach by combining level readout (4 digit LCD), electronic output (4-20 mA, 0-1 mA, 0 to −10 VDC, and RS-232C/422A) and/or three 10 amp DPDT control relays. The illustration at right shows a typical application of a Series 82 utilizing a remote mounted rigid probe and calibrated for high level alarm and control of 2 pumps.

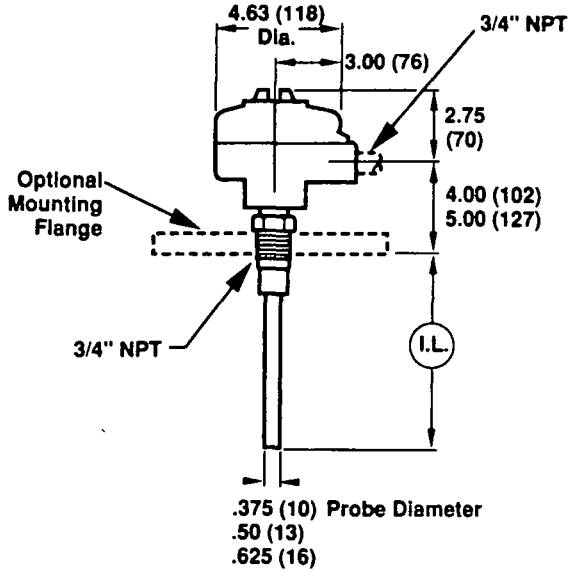


Dimensional specifications Inches (mm)

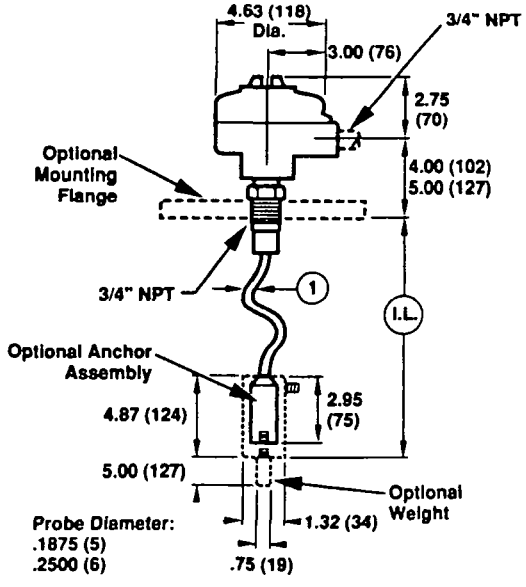
Transmitter



Rigid Probe Assembly



Flexible Probe Assembly



Notes:

1. All dimensions in ( ) are in millimeters.
2. Probes should be installed so that the probe end is at least 2.00 (51) below the desired level control point with conductive materials or 4.00 (102) below the control point with non-conductive materials.
3. Allow 4.00 (102) overhead clearance for removal of remote mount probe cover.

Product warranty

All Magnetrol electronic and ultrasonic level controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment.

If returned within the warranty period, and upon factory inspection of the unit, the cause of the claim is determined to be covered under the warranty, then Magnetrol International will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of the equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol products.

Quality assurance

QUALITY MANAGEMENT INSTITUTE
A DIVISION OF CANADIAN STANDARDS ASSOCIATION

The quality assurance system in place at Magnetrol guarantees the highest level of quality throughout the company. Magnetrol is committed to providing full customer satisfaction both in quality products and quality service.

Magnetrol's quality assurance system is registered to ISO 9001 and Z299.1 affirming its committment to known international quality standards providing the strongest assurance of product/service quality available.

ASSURED QUALITY & SERVICE COST LESS

Magnetrol

5300 Belmont Road • Downers Grove, Illinois 60515-4499 • (708) 969-4000 • Fax 708-969-9489
6291 Dorman Road • Mississauga, Ontario L4V-1H2 • Phone: (416) 678-2720 • Fax 416-678-7407
Heikensstraat 6 • B 9240 Zele, Belgium • Tel. 052 45.11.11 • Telex 25944 • Fax 052 45.09.93
Regent Business Ctr., Jubilee Rd. • Burgess Hill, Sussex RH15 9TL U.K. • Tel: 0444-871313 • Telex 87255 • Fax 0444-871317

BULLETIN: 50-121.4
EFFECTIVE: February 1992
SUPERSEDES: April 1991

Magnetrol

Kotron™ R.F. Sensing Probes

Probe overview

Kotron R.F. sensing probes are available in over 45 standard configurations to handle a wide variety of application requirements. Probes may be combined with most Kotron R.F. level controls and transmitters.

Shown below is an overview of Kotron sensing probes. The first chart covers rigid probes; the second flexible probes. Major probe categories are listed down the left of the rigid probe matrix. Each column identifies the probe's rod size and type of seal within a category. The numbers listed in each block identify specific probes.

Recommended applications and more detailed information on each probe can be found in the charts shown in numeric order on Pages 2 through 4. The most commonly used probes are shaded in gray.

Rigid probes — Most commonly used probes

Probe Configuration	TFE Seal .250 Rod 316 SS Nut	ECTFE Seal .375 Rod 316 SS Nut	TFE Seal .500 Rod 316 SS Nut	Ceramic Seal .375 Rod 316 SS Nut	Ceramic Seal .500 Rod 316 SS Nut	Specialty Probes
Bare ⑤		5070 5072 (.50 rod)		5038 5052 ③	5005 5051 ⑥	**Seal, Nut & Insulation of the Same Material** 5021 — Kynar® 5023 — PVC 5076 — Halar® (ECTFE)
Insulated	5001 (.375 O.D.)	5059 (.500 O.D.)	5017, 5093 (.625 O.D.)			**Specialty Metals ⑥** 5073 — Monel 5074 — Hastelloy B 5075 — Hastelloy C
Stillwell (.75 I.D.)	6027	5067	5039 ①	5047 5054 ③	5090 5086 ③	**Kynar® Faced Flanges ④** 5080, 5081, 5082, 5083, 5084, 5085
Inactive Sheath 6" Std.	5002	5066	5042			5041 — Polypropylene insulation w/316 SS nut & .500 rod, .625 O.D.
Ground Wire	5030	5077	5029			5087 — Enhanced gain 1.25" tube probe
Bend	5032	5068 5069 ② 5071 ①	5035		5036	5088 — same as 5087 w/integral stillwell
Proximity Plate		5007		5045 5053 ③		5089 — .500 rod with 4" dia. stillwell
Reference Rod		5078				5095 — Kynar insulation w/316 SS nut & .500 rod, .625 O.D.
Faced Flange ④		5060 1.5"/150# 5061 1.5"/300# 5062 2.0"/150# 5063 2.0"/300# 5064 3.0"/150# 5065 3.0"/300#				
Sanitary			5094, 5097 (.625 O.D.)			

① Bare rod.
② With inactive sheath.
③ With heat extension.
④ Plastic faced carbon steel flange.
⑤ Consult factory for horizontal mounting of bare probes.
⑥ Sectionalized probe.

Flexible probes — Most commonly used probes

Part No.	Seal	Nut	Insulation	Cable O.D.	Overall O.D.
5101	Halar® (ECTFE)	316 SS	Halar® (ECTFE)	.1250	.1875
5102					.2500

Part No.	Seal	Nut	Insulation	Cable O.D.	Overall O.D.
5103	PVC	CPVC	PVC	.1250	.2500
5105	Ceramic	316 SS	None	.1875	.1875

Halar® is a registered trademark of Ausimont.
Kynar® is a registered trademark of Pennwalt.

Selection data

Kotron probe part numbers are identified by a numeric part numbering system. The part number provides exact specification of the probe's configurations and insertion length. This system is comprised of three distinct components. The first two digits indicate Kotron probe, the next four digits describe the probe configuration and the last three digits detail the insertion length.

Expedite ship plan

Several Kotron sensing probes are available for quick shipment, usually within two weeks after factory receipt of a purchase order. The models covered by "ESP" service are conveniently color coded below. Contact your Magnetrol Representative for lead times on other selections.

Part number construction

Example: 41-□□□□-□□□

- Kotron Sensing Probe
- 1 Probe Configuration
- 2 Probe Insertion Length

2 Probe insertion length

Insertion lengths for Kotron sensing probes are measured from the bottom of the threads of the mounting nut to the end of the probe. Rigid probe lengths from 6 to 234 inches, dependent upon model, are available in one inch increments. Standard flexible probe lengths from 10 to 150 feet are available in one foot increments. Custom lengths for both rigid and flexible probes are available by consulting the factory. The last three digits of the probe part number equal the insertion length required. Rigid probes are measured in inches; flexible probes in feet.

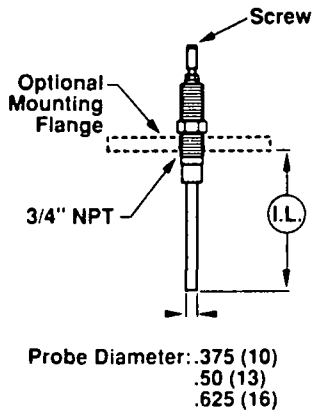
EXAMPLES:

For Rigid Probe insertion length of 8 inches order 41-XXXX-008.

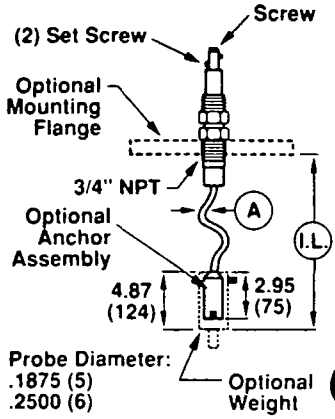
For Flexible Probe insertion length of 25 feet order 41-XXXX-025.

1 Probe configuration

Please refer to the charts on pages 2, 3 and 4. Should a flange be required to mount the probe, please refer to the flange chart on page 8 for the sizes and part numbers available. 41-5000 series probes have a ¾" NPT housing connection.



RIGID PROBE



FLEXIBLE PROBE

1 Rigid probe configurations

Probe Part No.	Application	Material		Probe Dia. Inches	Probe Pressure/Temperature Rating ⑦	
		Probe	Nut		Integral Mount	Remote Mount
41-5001	Conductive or non-conductive liquids and bulk materials under 40 lb./cu. Ft., 48" max. length	TFE	316 SS	.375	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5002	Conductive or non-condutive liquids and bulk materials under 40 lb./cu. ft., w/316 SS inactive sheath, 6" sheath standard, 48" max. length (7" min. insertion length)	TFE	316 SS	.375	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5005 ⑤	.5" bare rod, high temp./high pressure, ceramic seal	316 SS	316 SS	.500	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F 800 PSI @ 350°F
41-5007	6" dia. proximity plate for non-contacting applications, 48" max. length	316 SS	316 SS	.375	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5017	Conductive or non-conductive liquids and bulk materials over 40 lb./cu. ft., "ESP" to 96"	TFE	316 SS	.625	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5021	Corrosive liquids or Kynar (PVDF) reqmt., 120" max. lgth.	Kynar®	Kynar	.625	100 PSI @ 160°F	100 PSI @ 160°F
41-5023	Corrosive liquids or PVC reqmt., 60" max length	PVC	PVC	.625	100 PSI @ 160°F	100 PSI @ 160°F
41-5027	For low dielectric fluids/signal compensation on horizontal tanks/turbulent surface/free flow liquid only w/stilling well	Rod—TFE Well—316 SS	316 SS	.375 .875	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5029	Clean, conductive, non-viscous liquids with 316 SS ground wire	TFE	316 SS	.625	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5030	Clean, conductive, non-viscous liquids with 316 SS ground wire, 48" maximum length	TFE	316 SS	.375	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F

⑤ Consult the factory for horizontal mounting of bare probes.

Kynar® is a registered trademark of Pennwalt.

⑦ Temperature at electronics should not exceed + 160°F. Probe pressure/temp. ratings limited to the lesser value of the probe or flange selected.

⑧ Designed to mate with Triclover 16 AMP type fitting. For other sizes and configurations consult the factory.

1 Rigid probe configurations cont.

Probe Part No.	Application	Material		Probe Dia. Inches	Probe Pressure/Temperature Rating ⑦	
		Probe	Nut		Integral Mount	Remote Mount
41-5032	Conductive or non-conductive liquids and bulk materials under 40 lb./cu. ft., w/90° bend, 1" radius, 48" maximum length	TFE	316 SS	.375	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5035	Conductive or non-conductive liquids and bulk materials over 40 lb./cu. ft., w/90° bend, 2.5" radius, 110" max. length	TFE	316 SS	.625	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5036 ⑤	High temp./high pressure liquids w/90° bend, 2.5" radius, 110" max. length	316 SS	316 SS	.500	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F 800 PSI @ 350°F
41-5038 ⑤	High temp./high pressure liquids	316 SS	316 SS	.375	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F 800 PSI @ 350°F
41-5039	For low dielectric fluids/signal compensation on horizontal tanks/turbulent surface/free flow liquid only with stilling well	Rod—304 SS Well—304 SS	316 SS	.500 .875	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5041	Corrosive liquids or polypropylene requirement	Polypropylene	316 SS	.625	100 PSI @ 160°F	100 PSI @ 250°F
41-5042	Conductive or non-conductive liquids and bulk materials over 40 lb./cu. ft., w/316 SS inactive sheath, 6" sheath standard (7" min. insertion length)	TFE	316 SS	.625	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5045 ⑤	High temp./high pressure w/6" dia. proximity plate, 48" max. length	316 SS	316 SS	.375	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F
41-5047 ⑤	High temp./high pressure low dielectric liquids w/stilling well	Rod—316 SS Well—316 SS		.375 .875	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F
41-5051	High temp./high press., sectionalized 5' lengths, 31-5045-001, sections may be made to specific order, 15 ft. max.	316 SS	316 SS	.500	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F 800 PSI @ 350°F
41-5052 ⑤	High temp./high pressure liquids w/10" heat extension	316 SS	316 SS	.375	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F
41-5053 ⑤	High temp./high pressure w/6" dia. proximity plate and w/10" heat extension, 48" max. length	316 SS	316 SS	.375	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F
41-5054 ⑤	High temp./high pressure low dielectric liquids w/10" heat extension & stilling well	Rod—316 SS Well—316 SS	316 SS	.375 .875	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F
41-5059	Liquids or low density media	ECTFE	316 SS	.500	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5060	Corrosive liquids or ECTFE requirement w/ECTFE faced 1.5" 150 lb. carbon steel flange	ECTFE	ECTFE Faced Flange	.500	260 PSI @ 160°F	250 PSI @ 285°F
41-5061	Corrosive liquids or ECTFE requirement w/ECTFE faced 1.5" 300 lb. carbon steel flange	ECTFE	ECTFE Faced Flange	.500	700 PSI @ 160°F	300 PSI @ 285°F
41-5062	Corrosive liquids or ECTFE requirement w/ECTFE faced 2" 150 lb. carbon steel flange	ECTFE	ECTFE Faced Flange	.500	260 PSI @ 160°F	250 PSI @ 285°F
41-5063	Corrosive liquids or ECTFE requirement w/ECTFE faced 2" 300 lb. carbon steel flange	ECTFE	ECTFE Faced Flange	.500	700 PSI @ 160°F	300 PSI @ 285°F
41-5064	Corrosive liquids or ECTFE requirement w/ECTFE faced 3" 150 lb. carbon steel flange	ECTFE	ECTFE Faced Flange	.500	260 PSI @ 160°F	250 PSI @ 285°F
41-5065	Corrosive liquids or ECTFE requirement w/ECTFE faced 3" 300 lb. carbon steel flange	ECTFE	ECTFE Faced Flange	.500	700 PSI @ 160°F	300 PSI @ 285°F
41-5066	Liquids or low density media w/316 SS inactive sheath, 6" sheath standard (9" min. insertion length)	ECTFE	316 SS	.500	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5067	For low dielectric fluids/signal compensation on horizontal tanks/turbulent surface/free flow liquid only w/stilling well	Rod—ECTFE Well—316 SS	316 SS	.500 .875	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5068	Liquids or low density media w/90° bend, 1.5" radius	ECTFE	316 SS	.500	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5069	Liquids or low density media w/90° bend and inactive length, 1.5" radius, 110" max. length	ECTFE	316 SS	.500	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5070 ⑤	Fluids as point sensor, non-conductive fluids as transmitter, low density bulk media	316 SS	316 SS	.375	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F

⑤ Consult factory for horizontal mounting of bare probes.

⑦ Temperatures at electronics should not exceed + 160°F. Probe pressure/temp. ratings limited to the lesser value of the probe or flange selected.

1 Rigid probe configurations cont.

Probe Part No.	Application	Material		Probe Dia. Inches	Probe Pressure/Temperature Rating ⑦	
		Probe	Nut		Integral Mount	Remote Mount
41-5071	Fluids as point sensor, non-conductive fluids as transmitter, low density bulk media w/90° bend, 1.5" radius, 120" max. length	316 SS	316 SS	.375	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5072 ⑤	High density bulk media, low dielectric fluids—ECTFE seal, 120" max. length	316 SS	316 SS	.500	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5073	Liquids requiring Monel, 120" max. length	Monel	Monel	.375	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5074	Liquids requiring Hastelloy B, 120" max. length	Hastelloy B	Hast. B	.375	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5075	Liquids requiring Hastelloy C, 120" max. length	Hastelloy C	Hast. C	.375	1000 PSI @ 70°F 500 PSI @ 180°F	1000 PSI @ 70°F 500 PSI @ 300°F
41-5076	Corrosive liquids and vapors	ECTFE	ECTFE	.500	500 PSI @ 100°F	150 PSI @ 285°F
41-5077	Clean, conductive, non-viscous liquids with 316 SS ground wire	ECTFE	316 SS	.500	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5078	Conductive fluids in non-metal tanks w/insulated reference rod and 3" 150 lb. faced flange	ECTFE	C/S Flange	.500	285 PSI @ 70°F 260 PSI @ 180°F	1000 PSI @ 70°F 230 PSI @ 285°F
41-5080	Corrosive liquids or Kynar requirement w/Kynar faced 1.5" 150 lb. carbon steel flange	Kynar®	Kynar Faced Flange	.625	260 PSI @ 160°F	260 PSI @ 160°F
41-5081	Corrosive liquids or Kynar requirement w/Kynar faced 1.5" 300 lb. carbon steel flange	Kynar	Kynar Faced Flange	.625	700 PSI @ 160°F	700 PSI @ 160°F
41-5082	Corrosive liquids or Kynar requirement w/Kynar faced 2" 150 lb. carbon steel flange	Kynar	Kynar Faced Flange	.625	260 PSI @ 160°F	260 PSI @ 160°F
41-5083	Corrosive liquids or Kynar requirement w/Kynar faced 2" 300 lb. carbon steel flange	Kynar	Kynar Faced Flange	.625	700 PSI @ 160°F	700 PSI @ 160°F
41-5084	Corrosive liquids or Kynar requirement w/Kynar faced 3" 150 lb. carbon steel flange	Kynar	Kynar Faced Flange	.625	260 PSI @ 160°F	260 PSI @ 160°F
41-5085	Corrosive liquids or Kynar requirement w/Kynar faced 3" 300 lb. carbon steel flange	Kynar	Kynar Faced Flange	.625	700 PSI @ 160°F	700 PSI @ 160°F
41-5086 ⑤	High temp./high presure low dielectric liquids w/10" heat extension & stilling well	Rod—316 SS Well—316 SS	316 SS	.500 .875	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F
41-5087	1.25" tube probe for short spans in low dielectric materials w/1.5" NPT conn., 120" max. length	316 SS	316 SS	1.25	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5088	1.25" tube probe, same as 41-5087 w/integral 2" C.S. stillwell and 2" NPT conn., 120" max. length	316 SS	316 SS	1.25 1.60	5000 PSI @ 100°F 2100 PSI @ 160°F	5000 PSI @ 100°F 450 PSI @ 285°F
41-5089 ⑤	High temp./high pressure probe with 4" carbon steel stillwell and 4" 150 lb. flange for use in viscous, low dielectric material	316 SS	316 SS	.500 4.26	285 PSI @ 100°F	230 PSI @ 350°F
41-5090 ⑤	High temp./high pressure low dielectric liquid w/stilling well	Rod—316 SS Well—316 SS	316 SS	.500 .875	5000 PSI @ 100°F 800 PSI @ 350°F	500 PSI @ 1000°F
41-5093	High temp./high pressure requiring an insulated probe, 180" max. length	TFE	316 SS	.625	3000 PSI @ 70°F 2000 PSI @ 180°F	3000 PSI @ 70°F 200 PSI @ 400°F
41-5094 ⑧	Sanitary probe w/3A authorization and 1" or 1.5" sanitary fitting standard, 180" max. length	TFE	316LSS	.625	Ratings determined by clamp type chosen. Probe exceeds all clamp ratings.	
41-5095	For conductive media requiring high capacitance gain/inch	Kynar	316 SS	.625	3000 PSI @ 70°F 1000 PSI @ 180°F	3000 PSI @ 70°F 500 PSI @ 250°F
41-5097 ⑧	Sanitary probe w/3A authorization and 2" sanitary fitting standard, 180" max. length	TFE	316LSS	.625	Ratings determined by clamp type chosen. Probe exceeds all clamp ratings.	

⑤ Consult the factory for horizontal mounting of bare probes.

Kynar® is a registered trademark of Pennwalt.

⑦ Temperature at electronics should not exceed + 160°F. Probe pressure/temp. ratings limited to the lesser value of the probe or flange selected.

⑧ Designed to mate with Triclover 16 AMP type fitting. For other sizes and configurations consult the factory.

1 Flexible probe configurations

Probe Part No.	Application	Material		Probe Dia. Inches	Probe Pressure/Temperature Rating ⑦	
		Probe	Nut		Integral Mount	Remote Mount
41-5101	All media	ECTFE	316 SS	.1875	100 PSI @ 160°F	50 PSI @ 285°F
41-5102	Conductive media w/span over 40 feet	ECTFE	316 SS	.2500	100 PSI @ 160°F	50 PSI @ 285°F
41-5103	Conductive media requiring PVC	PVC	CPVC	.2500	5 PSI @ 140°F	5 PSI @ 140°F
41-5105	High temp./high pressure w/spans over 10 feet	316 SS	316 SS	.1875	5000 PSI @ 100°F	800 PSI @ 350°F 500 PSI @ 650°F

Capacitance pico Farad (pF) gain graphs

Pages 5–7 contain capacitance gain graphs which can be used to determine the proper probe/electronics choice for any given application. To use the graphs, follow the steps below.

1. Determine the dielectric of the process medium being measured. If the dielectric is unknown, use a dielectric of 2 for nonconductive media such as hydrocarbons or dry media, and a dielectric value of 80 for water based, conductive fluids (dielectric values are along the X axis).
2. Choose a probe. Since more than one probe will usually work, consider the other application parameters such as temperature, pressure, material compatability, etc.
3. Find the graph which covers the chosen probe. Choose the curve on the graph which most closely relates to your particular application (Stillwell, 4″ tank dia., 12″ tank dia., 48″ tank dia., 96″ tank dia., 120″ tank dia.).
4. Using the chosen curve, determine the amount of pF/inch your application will develop (pF/inch values are on Y axis).
5. Multiply the pF/inch value by the total inches of probe needed in your application.
6. Compare total capacitance generated by probe against the needed zero and span of the Kotron electronics to be used.

Range of capacitance adjustment

Kotron Electronics	Zero/ Set Point	Differential/Span
Point Sensors 80/81	0–3000 pF	NDA—.5 pF, Non-Adjustable WDA—High Range 4–1500 pF Low Range 2–500 pF
Two-Wire Transmitter 82-8	0–1000 pF	50–4000 pF
System 82 Transmitter 82-5	0–10,000 pF	10–15,000 pF

Example:

Parameters:
a. Dielectric = 2.5
b. Probe = Part No. 41-5027 (with stillwell)
c. pF/inch = 1.5
d. Electronics = Kotron Two-Wire Transmitter
e. Required application span = 72 inches
f. Electronics span = 50pF min. to 4000 pF max. (See chart above.)

1.5 pF/inch x 72 inches = 108 pF
The total capacitance is enough to meet the 50 pF minimum span of the electronics.

These charts are meant as an application aid; actual values may differ slightly. Always give yourself a 10% margin of error to ensure satisfactory performance.

These curves represent the probe concentrically located within each diameter. If the probe is near one wall of a large tank, do the following: multiply the distance from the tank wall by 2 (to develop a diameter), choose the closest curve in the chart to your application, and then multiply the resultant pF value x 78%. This will account for the probe not being totally surrounded by the ground reference.

Rigid bare probes

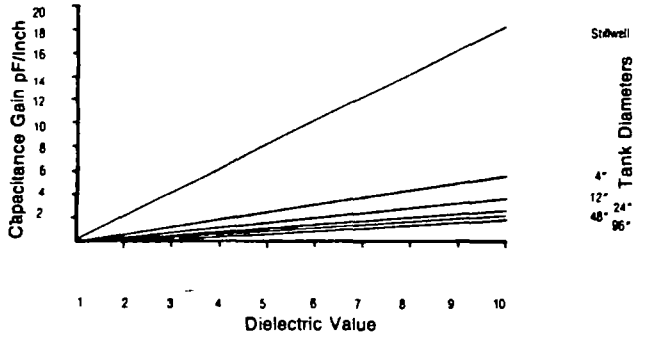


Chart A

Chart A covers the following rigid bare probe configurations with a .375″ rod, ceramic seal and 316 SS nut:

41-5038
41-5047 with stillwell
41-5052
41-5054 with stillwell

Chart B covers the following rigid bare probe configurations with a .500″ rod, ceramic seal and 316 SS nut:

41-5005
41-5036
41-5039 with *TFE seal* and stillwell
41-5051
41-5086 with stillwell
41-5090 with stillwell

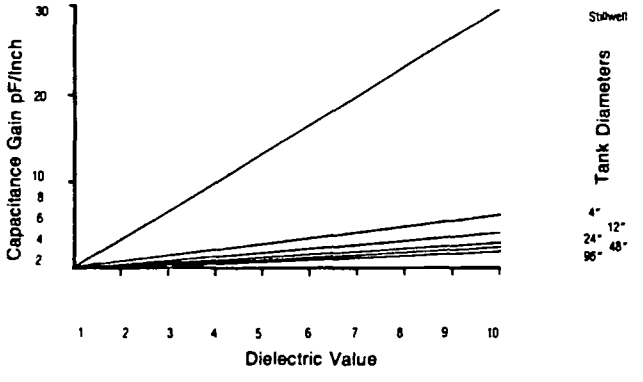


Chart B

CLIENT:	NO.	BY	DATE	REVISION	SHEET 1 OF 1
MEDLEY FARMS	A	VPM	5-26-93	CLIENT REVIEW	
GAFFNEY, SC					SPEC. NO. FV-200A
					CONTRACT 938.11
					DATE
SOLENOID VALVES	BY	CHK'D	E&I APRV	PIPING APRV	REQ.-P.O.
	VPM				

	1	Tag Number			FV-200A		FV-200B		FV-200C	
	2	P & ID Number			938-C04		938-C04		938-C04	
	3	Service			ON-OFF		ON-OFF		ON-OFF	
	4	Quantity			ONE		ONE		ONE	
	5	Type			GLOBE		GLOBE		GLOBE	
	6	Size	Body	Port	2"	2 3/32"	2"	2 3/32"	2"	2 3/32"
	7	Rating	Type Conn.		MFG STD	2" NPT	MFG STD	2" NPT	MFG STD	2" NPT
	8	Material - Body			ALUMINUM		ALUMINUM		ALUMINUM	
	9	Material - Seat			SEALS & DISC-ALUM		SEALS & DISC-ALUM		SEALS & DISC-ALUM	
	10	Material - Diaphragm			BUNA N		BUNA N		BUNA N	
	11	Operation Direct/Pilot			DIRECT		DIRECT		DIRECT	
VALVE BODY	12	Packless or Type Packed			MFG STD		MFG STD		MFG STD	
	13	Manual Re-Set			NO		NO		NO	
	14	Manual Operator			NO		NO		NO	
	15									
	16									
	17	2-Way Valve Opens/Close			CLOSES		CLOSES		CLOSES	
	18	3-Way								
	19	Vent Port Opens/Close								
	20	Press Port Opens/Close								
WHEN	21	4-Way								
DE-ENERGIZED	22	Press to Cyl.1/Cyl.2								
	23	Exh. to Cyl.1/Cyl.2								
	24									
	25									
	26	Enclosure			NEMA 4X		NEMA 4X		NEMA 4X	
	27	Voltage	Hertz		120	60 HZ	120		120	
SOLENOID	28	Style of Coil			CONTINUOUS DUTY		CONTINUOUS DUTY		CONTINUOUS DUTY	
	29	Single or Double Coil			SINGLE		SINGLE		SINGLE	
	30									
	31									
	32	Fluid			WATER		WATER		WATER	
	33	Qty. Maximum			50 GPM		50 GPM		50 GPM	
	34	Oper. Diff.Min	Max PSIG		<1 PSIG	4	<1 PSIG		<1 PSIG	
	35	Allow.Diff.Min	Max PSIG		<1 PSIG	4	<1 PSIG		<1 PSIG	
	36	Temp. Normal	Max oF		AMB.	100	AMB.		AMB.	
SERVICE	37	Oper. sp.gr.			1.0		1.0		1.0	
CONDITIONS	38	Oper. Viscosity			1.0		1.0		1.0	
	39	Required Cv			50		50		50	
	40	Valve Cv			60		60		60	
	41									
	42									
	43									
	44									
	45	Manufacturer			ASCO		ASCO		ASCO	
	46	Model Number			EF8215B80		EF8215B80		EF8215B80	

NOTES:

1. Supply 7 sets of maintenance manuals, parts list, & instructions.
2. Supply & attach SS tags at the factory.

2 WAY

luminum Body Solenoid Valves

8040/8215 SERIES

Direct Lift and Pilot Operated • ⅜" to 3" N.P.T.

ecifications

lenoid Enclosures: Valves listed in series have either Red-Hat metal enoid enclosures or Red-Hat II olded epoxy solenoids. Red-Hat II ves are identified by the change ter "G" in their catalog numbers, g., 8040G10, and are shown in red.

ndard Enclosures:
d-Hat — Type 1 General Purpose

ed-Hat II — Types 1, 2, 3, 3S, 4 and Combination General Purpose and atertight.

Optional Enclosures:
ed-Hat — Types 3, 7 and 9 ombination Explosionproof and Raintight. To order, add prefix "EF" to catalog number. (Except Catalog Numbers EF8215A40, EF8215A90 and EF8215B93.)[2]

Red-Hat II — Types 3, 3S, 4, 4X, 6, 6P, and 9 Combination Explosionproof and Watertight. To order, add prefix "EF" to catalog number.

Additional constructions are available. The Optional Electrical Features Section, page 11, contains descriptions and ordering information for: Open Frame Solenoids • Junction Box Enclosures • Panel Mount Constructions.

Electrical: Standard Voltages: 24, 120, 240, 480 volts, AC, 60 Hz (or 110, 220 volts, AC, 50 Hz)

6, 12, 24, 120, 240 volts, DC

Other voltages are available when required.

Coil: Continuous duty molded Class B or F as listed.

Nominal Ambient Temperature Ranges: Red-Hat and Red-Hat II Valves/AC Construction: 32°F. to 125°F.

Red-Hat Valves/DC Construction: 32°F. to 77°F. (104°F. occasionally).

Red-Hat II Valves/DC Construction: 32°F. to 104°F.
Refer to Engineering Section for details.

Valve Parts in Contact with Fluids:
Body — Aluminum
Seals, Diaphragms and Discs — Buna "N"
Disc Holder — Nylon (10.1 and 11.6 watt Normally Open only)
Core Guide — Acetal
Rider Rings — Filled Teflon*
Core and Plugnut — 430F s.s., Silicone Steel (8215A40 and 8215A90)
Springs — 302 s.s.
Shading Coil — Copper

Approvals: CSA certified. UL listed as indicated. FM approved (Normally Closed valves only; except Catalog Numbers 8215A90 and 8215A40). Refer to Engineering Section for details.

Ordering Information:
Important: We must have catalog number, voltage and Hertz, operating pressure and fluid handled. Use strainers with solenoid valves.

*DuPont Co. trademark

SPECIFICATIONS

Pipe Size (Ins.)	Orifice Size (Ins.)	Cv Flow Factor	Operating Pressure Differential (psi) Min.	Max. AC Air-Fuel Gas	Max. DC Air-Fuel Gas	Max. Fluid Temp. °F. AC	Max. Fluid Temp. °F. DC	Standard Solenoid Enclosures Red-Hat–Type 1 Red-Hat II–Types 1, 2, 3, 3S, 4 and 4X Aluminum Body Catalog Number	Constr. Ref. No.	UL Listing	Watt Rating/ Class of Coil Insulation ③ AC	Watt Rating/ Class of Coil Insulation ③ DC
NORMALLY CLOSED (Closed when de-energized)												
⅜	⅜	1.2	0	15	—	125	—	8040G8	11	o	6.1/F	—
½	¾	3.4	0	50	25	125	104	8215G10	2	o	10.1/F	11.6/F
½	¾	3.5	5	125	125	125	104	8215G1①	1	o	6.1/F	11.6/F
½	¾	5.4	0	2	—	125	—	8040G22	13A	p	10.1/F	—
½	¾	4.4	0	50	25	125	104	8215G20	2	o	10.1/F	11.6/F
½	¾	4.8	5	125	125	125	104	8215G2①	1	o	6.1/F	11.6/F
¾	¾	9.5	0	2	—	125	—	8040G23	13B	o	10.1/F	—
¾	¾	5.1	0	50	25	125	104	8215G30	4	o	10.1/F	11.6/F
¾	¾	5.1	5	125	125	125	104	8215G3①	3	o	6.1/F	11.6/F
1	1⅛	21	0	25	25	125	77	8215B50	6	o	15.4/F	14.9/B
1¼	1⅛	32	0	25	25	125	77	8215B60	6	o	15.4/F	14.9/B
1½	1⅛	35	0	25	25	125	77	8215B70	6	o	15.4/F	14.9/B
2	2⅛	60	0	25	15	125	77	8215B80	7	o	15.4/F	14.9/B
2½	3	117	0	5	—	125	—	8215A90	8	p	28.2/F	—
3	3	138	0	5	—	125	—	8215A40	8	o	28.2/F	—

SPECIFICATIONS

Pipe Size (Ins.)	Orifice Size (Ins.)	Cv Flow Factor	Operating Pressure Differential (psi) Min.	Max. AC Air-Fuel Gas	Max. DC Air-Fuel Gas	Max. Fluid Temp. °F. AC	DC	Standard Solenoid Enclosures Red-Hat–Type 1 Red-Hat II–Types 1, 2, 3, 3S, 4 and 4X Aluminum Body Catalog Number	Constr. Ref. No.	UL Listing	Watt Rating/ Class of Coil Insulation AC	DC
NORMALLY OPEN (Open when de-energized)												
3/8	3/4	3.2	0	125	125	125	104	8215G13	9	•	10.1/F	11.6/F
1/2	3/4	4	0	125	125	125	104	8215G23	9	•	10.1/F	11.6/F
3/4	3/4	4.6	0	125	125	125	104	8215G33	10	•	10.1/F	11.6/F
1	1 5/8	22	0	25	15	125	77	8215C53	12	•	15.4/F	14.9/B
1 1/4	1 5/8	33	0	25	15	125	77	8215C63	12	•	15.4/F	14.9/B
1 1/2	1 5/8	37	0	25	15	125	77	8215C73	13	•	15.4/F	14.9/B
2	2 3/32	58	0	25	15	125	77	8215C83	14	•	15.4/F	14.9/B
2 1/2	3	117	0	5	—	125	—	8215B93	15	•	28.2/F	—

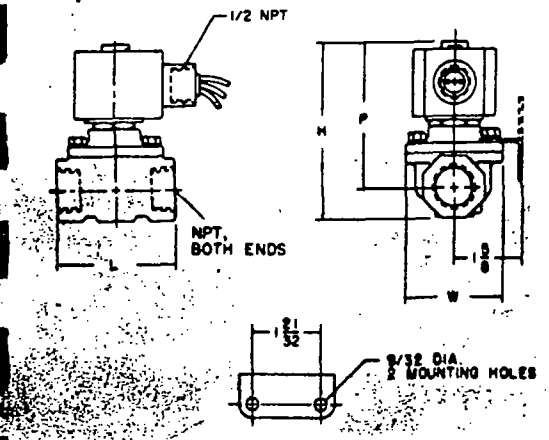
Notes: ① Do not use for Fuel Gas.
② Suitable for Types 4 and 7 (C and D) only, and have a T&B temperature range code. See Engineering Section, beginning on page 97, for details.
③ On 50 Hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.

ELECTRICAL INFORMATION

Standard Coil and Class of Insulation	Watt Rating and Power Consumption DC Watts	AC Watts	AC VA Holding	AC VA Inrush	Spare Coil Part No. General Purpose AC	General Purpose DC	Explosionproof AC	Explosionproof DC
F	—	6.1	16	40	238210	—	238214	—
F	11.6	10.1	25	70	238610	238710	238614	238714
B	14.9	—	—	—	—	62691	—	—
F	—	15.4	27	160	99257	—	99257	—
F	—	28.2	50	385	206409	—	206409	—

DIMENSIONS (in Inches)

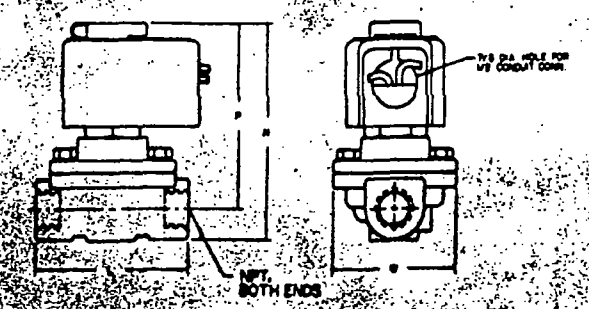
Constr. Refs. 1–4, 9, 10, 13A, 13B



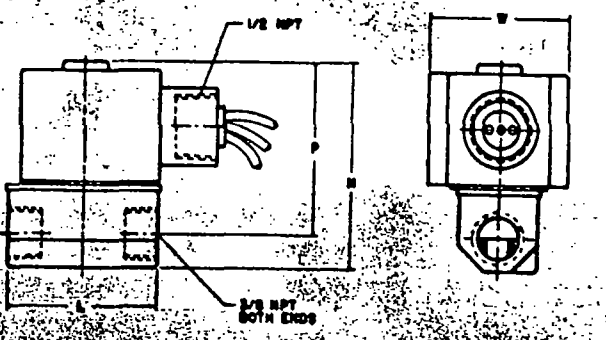
Constr. Ref. No.	H	L	P	W	Constr. Ref. No.	H	L	P	W
1	3 7/16	2 3/4	2 7/8	2 3/8	10	4 27/32	3 5/16	4 1/32	2 11/32
2	4 1/32	2 3/4	3 15/32	2 3/8	11	2 23/32	2	2 9/32	1 11/16
3	3 7/8	3 5/16	3 1/16	2 11/32	12	7 19/32	5	4 13/32	5 3/8
4	4 15/32	3 5/16	3 21/32	2 11/32	13	7 19/32	5	4 11/32	5 3/8
6#	6 27/32	5	5 19/32	5 3/8	13A	4 1/32	2 3/4	3 7/16	2 3/8
7#	7 15/32	6 3/32	5 15/16	6 5/16	13B	4 7/16	3 5/16	3 5/8	2 11/32
8#	10 1/4	7 51/64	7 29/32	7 15/16	14⊕	8 3/16	6 3/32	4 19/32	6 5/16
9	4 13/32	2 3/4	3 27/32	2 3/8	15⊕	10 1/4	7 51/64	5 7/32	7 15/16

IMPORTANT: Valves may be mounted in any position except all DC constructions and those marked # which must be mounted with the solenoid vertical and upright. Constructions marked ⊕ must be mounted with the solenoid vertical and upright or horizontal only.

Constr. Refs. 6–8, 12–15



Constr. Ref. 11



CLIENT:	NO.	BY	DATE	REVISION	SHEET 1 OF 1
MEDLEY FARMS	A	VPM	5-26-93	CLIENT REVIEW	
GAFFNEY, SC					SPEC. NO. FIT-500
					CONTRACT 938.11
					DATE
	BY	CHK'D	E&I APRV	PIPING APRV	
FLOW METERING SYSTEM	VPM				REQ.-P.O.

MANUFACTURER: DREXELBROOK

MODEL NO.: 303-331-304

TYPE: ELECTRONIC

PROBE:

MODEL NO.:	700-703-304
SIZE:	TO FIT 3" PARSHALL FLUME (MOUNTING TRACK AND GROUND PLATE TO BE FURNISHED W/FLUME)
TYPE:	FLUSH MOUNTED, COTE SHIELD CIRCUITRY
RANGE:	0-389 GPM MAX, 0-70 GPM MIN. SPAN, CALIBRATED 0-160 GPM
MOUNTING:	MOUNTING TRACK INTEGRAL TO PARSHALL FLUME
ELECT. CONNECT.:	3 CONDUCTOR CABLE POTTED AT PROBE END, 25' LONG
TAG NO.:	FE-500

ELECTRONICS PACKAGE: MODEL NO. 303-331-2 CONSISTING OF THE FOLLOWING:
HOUSING: NEMA 4X FIBERGLASS, APPROX. 14" X 16" X 8"
SERIES 408-6200 INDICATING TRANSMITTER
CALIBRATED: 4-20 mA = 0-160 GPM
MODEL NO. 370-3020-1 DIGITAL RATE METER

MODEL 334-2-8 7-DIGIT NON-RESETTABLE TOTALIZER

MODEL 334-3-2 INTEGRATOR

MODEL 401-13-31 POWER SUPPLY, 120VAC IN, 45VDC OUT

OUTPUT: RATE OF FLOW: 4-20 mA
TOTALIZED FLOW: 24 VDC PULSE
1 PULSE = 10 GALLONS

TAG NO.: FIT-500
FQI-500

PROCESS DATA:

FLUID:	WATER
FLOW:	0-150 GPM
TEMP.:	AMBIENT
PRESS.:	ATMOSPHERIC

NOTES:
1. FURNISH 7 SETS OF MAINTENANCE MANUALS, PARTS LIST, AND INSTRUCTIONS.
2. FURNISH AND ATTACH SS TAGS AT THE FACTORY.

APPENDIX G
DESIGN CALCULATIONS

RMT, INC.

DESIGN SHEET

SHEET_____ OF_____

100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Medley Farm	JCM	5/15/03			938.11

Design Calculations

RMT INC.

DESIGN SHEET

SHEET 1 OF

100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Medley Farm	JLM	4/20/13			938.11

Jet Pump - Circuit A - Prime Mover

1) Static Head - (Jet Pump EL) - (Pump Elev)
503 - 631 = -128 ft. (Top of well below Pump Elevation)

2) Friction Loss (Friction based on C=100, correction to 150 @ End)

a) From Pump to 'T' @ A-6 (Use 300 gpm)
8" Pipe - 800' × (0.52/100) = 2.6 ft

b) From Header to Eductor (Use 30 gpm)

• 2"×8" Tee	45' × (3.84/100)	= 1.7'
• 2" PVC Pipe	100' × (3.84/100)	= 3.8'
• Pressure Gauge	2 psi × 2.31 ft/psi	= 4.6'
• 2" Ball Valve	30' × (3.84/100)	= 1.2'
• 2"×1½" Reducer (2)	3' × (11%/100)	= 0.3'
• 1½" Water Meter	3 psi × 2.31 ft/psi	= 6.9'
• 2"×1" Reducer	2' × (89.0/100)	= 1.8'
• Pitless Adapter	3' × (89.0/100)	= 2.7'
• 1½"×1" Reducer	2' × (89.0/100)	= 1.8'
• 1½" Hose	128 L.F. × (8.5/100)	= 10.9'
• 1½" 90° Bends (2)	2.5' × (71.6/100)	= 1.1'
		36.8 ft.

c) Total Friction Loss (36.8 + 2.6) $(\frac{100}{150})^{1.85}$ = 18.6 ft.

3) The Required Pressure @ Eductor - 180 psi × 2.31 = 415.8 ft.

4) Total Head - (-128) + 18.6 + 415.8 = 306.4 ft. use 320 TDH

∴ Pump must deliver 300 gpm @ 320 TDH

RMT INC.

100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

DESIGN SHEET

PROJECT/PROPOSAL NAME	PREPARED By:	PREPARED Date:	CHECKED By:	CHECKED Date:	PROJECT/PROPOSAL NO.
Medley Farm	JLM	4/17/03			938.11

Jet Pump Design - Circuit A

Number of Wells - 7 1st Selection: 1" LH @ 180psi - est. 160' Head
Desired Flow Out - Q_s = 11 gpm
Estimated Flow In - Q_m = 30 gpm
Estimated Total Flow - Q_T = 41 gpm
Estimated System Flow - 7 x 41 gpm = 287 gpm ~ use 300 gpm

∴ For 300 gpm use 8" header pipe.

Head Loss

1) Static Head - Tank El. - 640 ft. (Pad El. 630 + 10' for tank)
Bottom of Well - 503 ft (A-6)
Static Head 137 ft.

2) Friction Loss (Friction based on C=100, correction to 150 @ End)

a) Eductor to header
- 1½" hose - 123 x (14.3/100') = 17.6'
- Pitless Adapter - (½ Reducer) - 2 x 25' 10.8/100 = 0.9'
- 1½" Water Meter - 3psi x 2.31 ft/psi = 6.9'
- 2" x 1½" Reducer - 1.5' x (6.6/100) = 0.1'
- 2" Check Valve - 15' x (6.6/100) = 1.0'
- 2" Ball Valve - 30' x (6.6/100) = 2.0
- 2" PVC Pipe - 100 LF. x (6.6/100) = 6.6

35.1 ft

b) Header to Tank
- 8" Pipe - 800 x 0.32/100 = 2.6 ft

c) Total Friction Loss - $(35.1 + 2.6)\left(\frac{100}{150}\right)^{1.85}$ = 17.8 ft

3) Total Head - 137 + 17.8 = 154.8 feet use 160 ft. ⇒

Jet Pump Selection
1" LH @ 180 psi
Q_s = 11.3 gpm
Q_m = 30.3 gpm
Q_T = 41.6 gpm

RMT INC.

DESIGN SHEET

SHEET 3 OF

100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Medley Farm	JLM	4/22/93			938.11

Jet Pump Circuit B - Prime Mover

1) Static Head - (Jet Pump EL.) - (Pump EL.)

518 - 631 = - 113 ft.

(Top of Well El.) - (Pump El.)

665 - 631 = + 34 ft

- 79 ft.

2) Friction Loss - Use Loss calculated for Circuit A Prime Mover - 18.6 ft

3) Pressure Required @ Eductor - 180 psi × 2.31 = 415.8 ft.

4) Total Head (-79) + 18.6 + 415.8 = 355.4 use 360 TDH

∴ Pump must deliver 250 gpm @ 360 TDH

RMT INC.
100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

DESIGN SHEET

SHEET 4 OF

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Medley Farm	JLM	4/20/93			938.11

Jet Pump Design - Circuit B

Number of Wells - 6 1st Selection: 1" LH @ 180 psi - est. 160' Head
Desired Flow Out - Q_s = 11 gpm
Estimated Flow In - Q_m = 30 gpm
Estimated Total Flow - Q_T = 41 gpm
Estimated System Flow = 6 x 41 gpm = 246 gpm use 250 gpm

∴ For 250 gpm

Head Loss

1) Static Head - Greatest head to overcome is @ B = 0
Pipe El. @ Pit 651
Bedrock El. 518.
133 ft.

2) Friction Loss (Friction based on C=100, correction to 150 @ End)

a) Eductor to Header
- 1½" hose - 133 x (16.3/100) = 19.0'
- Pitless Adapter (Use 90° Bend) - 5 x (18.8/100) = 0.9'
- 1½" Water Meter 3 psi x 2.31 ft/psi = 6.9'
- 2"x1½" Reducer 15' x (6.6/100) = 0.1'
- 2" Check Valve 15' x (6.6/100) = 1.0'
- 2" Ball Valve 30' x (6.6/100) = 2.0'
- 2" PVC Pipe 50' x (6.6/100) = 3.3'

33.2 ft

b) Header to Tank
- 8" Pipe - 650 x 0.32/100 = 2.1 ft

c) Total Friction Loss $(33.2 + 2.1)\left(\frac{400}{150}\right)^{1.85}$ = 16.7 ft.

3) Total Head - 133 + 16.7 = 149.7 ft. use 150 ft ⇒

No Change in Selection

JET PUMP SELECTION
1" LH @ 180 psi
Q_s = 11.3 gpm
Q_m = 30.3 gpm
Q_T = 41.6 gpm

RMT INC.

DESIGN SHEET

100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Medley Farm	JLM	4/17/93			938.11

Recirculation Tank

Circuit A - 750 LF x $\pi(\frac{4}{12})^2$ x 2 x 7.48 = 3917 gallons

Circuit B - 600 L.F. x $\pi(\frac{4}{12})^2$ x 2 x 7.48 = 3133 gallons

7050 gallons

Wells - 50 gallons/well x 13 wells = 650 gallons

7700 gallons

RMT INC.

DESIGN SHEET

100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

PROJECT/PROPOSAL NAME	PREPARED By:	PREPARED Date:	CHECKED By:	CHECKED Date:	PROJECT/PROPOSAL NO.
Medley Farm	LM	5/24/93			938.11

Maximum Ditch/Culvert Flows (Not Including Unnamed Tributary)

TYPICAL DIVERSION DITCH:

Max. Area = 1 acre = 0.0015625 sq. mi.
ΔH = 46 ft.
L = 430 ft.
Slope = 46/430 = 0.107 ft/ft

* FLOW CALCULATIONS ATTACHED

Min Ditch Slope: 1.0%
Max Ditch Slope: 10.0%
Side Slopes: 2 to 1, 'V' bottom * ANALYSIS ATTACHED

SMALL AREA DITCH

Max Area = 0.4 acres = 0.00065 sq. mi
ΔH = 30 ft.
L = 300 ft.
Slope = 30/300 = 0.10 ft/ft.

* FLOW CALCULATIONS ATTACHED

Min Ditch Slope 1.0%
Max Ditch Slope 10.0%
Side Slopes: 2 to 1, 'V' bottom * ANALYSIS ATTACHED

SCS Hydrograph Generation Program

MEDLEY FARM - SMALL AREA DITCH (10 YEAR / 24 HOUR)

DRAINAGE AREA = .00065 SQUARE MILES
TIME OF CONCENTRATION = 6.380106E-02 HOURS
RUNOFF CURVE NUMBER = 85
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 5.1 INCHES
RUNOFF = 3.46 INCHES = 0.12 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 3.46

*** MAXIMUM FLOW = 2.33 CFS AT 11.9 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
24.00	5.10	3.46	0.02

SCS Hydrograph Generation Program

MEDLEY FARM - SMALL AREA DITCH (25 YEAR / 24 HOUR)

DRAINAGE AREA = .00065 SQUARE MILES
TIME OF CONCENTRATION = 6.380106E-02 HOURS
RUNOFF CURVE NUMBER = 85
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 5.9 INCHES
RUNOFF = 4.21 INCHES = 0.15 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 3.46

*** MAXIMUM FLOW = 2.82 CFS AT 11.9 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
24.00	5.90	4.21	0.03

SCS Hydrograph Generation Program

MEDLEY FARM - TYPICAL DIVERSION DITCH (10 YEAR / 24 HOUR)

DRAINAGE AREA = .0015625 SQUARE MILES
TIME OF CONCENTRATION = 6.987724E-02 HOURS
RUNOFF CURVE NUMBER = 85
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 5.1 INCHES
RUNOFF = 3.46 INCHES = 0.29 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 2.66

*** MAXIMUM FLOW = 5.57 CFS AT 11.9 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
24.00	5.10	3.46	0.05

SCS Hydrograph Generation Program

MEDLEY FARM - TYPICAL DIVERSION DITCH (25 YEAR / 24 HOUR)

DRAINAGE AREA = .0015625 SQUARE MILES
TIME OF CONCENTRATION = 6.987724E-02 HOURS
RUNOFF CURVE NUMBER = 85
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 5.9 INCHES
RUNOFF = 4.21 INCHES = 0.35 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 2.66
*** MAXIMUM FLOW = 6.72 CFS AT 11.9 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
24.00	5.90	4.21	0.06

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name:

Description:

Solve For Depth

Given Constant Data;

Bottom Width.....	0.00
Z-Left.....	2.00
Z-Right.....	2.00
Mannings 'n'.....	0.030

Variable Input Data	Minimum	Maximum	Increment By
Channel Slope	0.0100	0.1000	0.0100
Channel Discharge	2.00	7.00	1.00

Bottom Width ft	Z-Left (H:V)	Z-Right (H:V)	Mannings 'n'	VARIABLE Channel Slope ft/ft	COMPUTED Channel Depth ft	VARIABLE Channel Discharge cfs	COMPUTED Velocity fps	
0.00	2.00	2.00	0.030	0.0100	0.67	2.00	2.22	
0.00	2.00	2.00	0.030	0.0200	0.59	2.00	2.88	
0.00	2.00	2.00	0.030	0.0300	0.55	2.00	3.35	
0.00	2.00	2.00	0.030	0.0400	0.52	2.00	3.73	
0.00	2.00	2.00	0.030	0.0500	0.50	2.00	4.06	
0.00	2.00	2.00	0.030	0.0600	0.48	2.00	4.35	
0.00	2.00	2.00	0.030	0.0700	0.47	2.00	4.61	
0.00	2.00	2.00	0.030	0.0800	0.45	2.00	4.84	
0.00	2.00	2.00	0.030	0.0900	0.44	2.00	5.06	
0.00	2.00	2.00	0.030	0.1000	0.44	2.00	5.27	
0.00	2.00	2.00	0.030	0.1100	0.43	2.00	5.46	
0.00	2.00	2.00	0.030	0.0100	0.78	3.00	2.46	
0.00	2.00	2.00	0.030	0.0200	0.69	3.00	3.19	
0.00	2.00	2.00	0.030	0.0300	0.64	3.00	3.71	
0.00	2.00	2.00	0.030	0.0400	0.60	3.00	4.13	
0.00	2.00	2.00	0.030	0.0500	0.58	3.00	4.49	
0.00	2.00	2.00	0.030	0.0600	0.56	3.00	4.81	
0.00	2.00	2.00	0.030	0.0700	0.54	3.00	5.10	EROSION CONTROL FABRIC
0.00	2.00	2.00	0.030	0.0800	0.53	3.00	5.36	
0.00	2.00	2.00	0.030	0.0900	0.52	3.00	5.60	
0.00	2.00	2.00	0.030	0.1000	0.51	3.00	5.83	
0.00	2.00	2.00	0.030	0.1100	0.50	3.00	6.04	
0.00	2.00	2.00	0.030	0.0100	0.87	4.00	2.64	
0.00	2.00	2.00	0.030	0.0200	0.76	4.00	3.42	
0.00	2.00	2.00	0.030	0.0300	0.71	4.00	3.99	
0.00	2.00	2.00	0.030	0.0400	0.67	4.00	4.44	
0.00	2.00	2.00	0.030	0.0500	0.64	4.00	4.83	
0.00	2.00	2.00	0.030	0.0600	0.62	4.00	5.17	
0.00	2.00	2.00	0.030	0.0700	0.60	4.00	5.48	
0.00	2.00	2.00	0.030	0.0800	0.59	4.00	5.76	
0.00	2.00	2.00	0.030	0.0900	0.58	4.00	6.02	
0.00	2.00	2.00	0.030	0.1000	0.57	4.00	6.26	
0.00	2.00	2.00	0.030	0.1100	0.56	4.00	6.49	
0.00	2.00	2.00	0.030	0.0100	0.95	5.00	2.79	
0.00	2.00	2.00	0.030	0.0200	0.83	5.00	3.62	
0.00	2.00	2.00	0.030	0.0300	0.77	5.00	4.22	
0.00	2.00	2.00	0.030	0.0400	0.73	5.00	4.70	
0.00	2.00	2.00	0.030	0.0500	0.70	5.00	5.11	
0.00	2.00	2.00	0.030	0.0600	0.68	5.00	5.47	
0.00	2.00	2.00	0.030	0.0700	0.66	5.00	5.79	

H:2.10 7 MAX

Bottom Width ft	Z-Left (H:V)	Z-Right (H:V)	Mannings 'n'	VARIABLE Channel Slope ft/ft	COMPUTED Channel Depth ft	VARIABLE Channel Discharge cfs	COMPUTED Velocity fps
0.00	2.00	2.00	0.030	0.0800	0.64	5.00	6.09
0.00	2.00	2.00	0.030	0.0900	0.63	5.00	6.36
0.00	2.00	2.00	0.030	0.1000	0.61	5.00	6.62
0.00	2.00	2.00	0.030	0.1100	0.60	5.00	6.86
0.00	2.00	2.00	0.030	0.0100	1.01	6.00	2.92
0.00	2.00	2.00	0.030	0.0200	0.89	6.00	3.79
0.00	2.00	2.00	0.030	0.0300	0.82	6.00	4.41
0.00	2.00	2.00	0.030	0.0400	0.78	6.00	4.91
0.00	2.00	2.00	0.030	0.0500	0.75	6.00	5.34
0.00	2.00	2.00	0.030	0.0600	0.72	6.00	5.72
0.00	2.00	2.00	0.030	0.0700	0.70	6.00	6.06
0.00	2.00	2.00	0.030	0.0800	0.69	6.00	6.37
0.00	2.00	2.00	0.030	0.0900	0.67	6.00	6.66
0.00	2.00	2.00	0.030	0.1000	0.66	6.00	6.93
0.00	2.00	2.00	0.030	0.1100	0.65	6.00	7.18
0.00	2.00	2.00	0.030	0.0100	1.07	7.00	3.04
0.00	2.00	2.00	0.030	0.0200	0.94	7.00	3.94
0.00	2.00	2.00	0.030	0.0300	0.87	7.00	4.59
0.00	2.00	2.00	0.030	0.0400	0.83	7.00	5.11
0.00	2.00	2.00	0.030	0.0500	0.79	7.00	5.55
0.00	2.00	2.00	0.030	0.0600	0.77	7.00	5.95
0.00	2.00	2.00	0.030	0.0700	0.75	7.00	6.30
0.00	2.00	2.00	0.030	0.0800	0.73	7.00	6.62
0.00	2.00	2.00	0.030	0.0900	0.71	7.00	6.92
0.00	2.00	2.00	0.030	0.1000	0.70	7.00	7.20
0.00	2.00	2.00	0.030	0.1100	0.68	7.00	7.46

TYPICAL DIVERSION DITCH

EROSION CONTROL FABRIC

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Description:

Solve For Actual Depth

Given Constant Data;

Mannings n..... 0.022

Variable Input Data	Minimum	Maximum	Increment By
Diameter	1.00	1.50	0.50
Slope	0.0100	0.1000	0.0100
Discharge	3.00	7.00	0.50

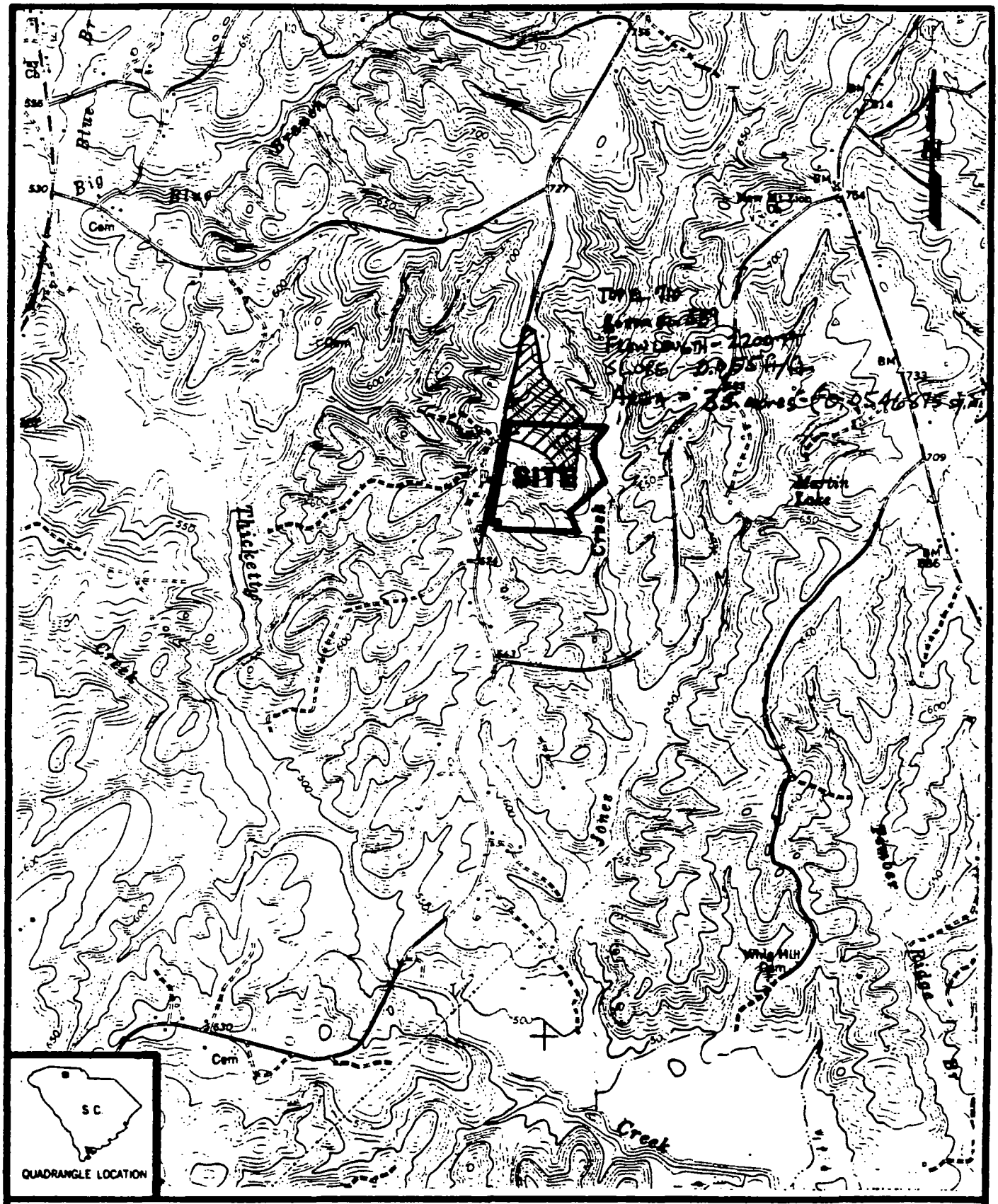
VARIABLE Diameter ft	VARIABLE Channel Slope ft/ft	Mannings 'n'	VARIABLE Discharge cfs	COMPUTED Depth ft	COMPUTED Velocity fps	COMPUTED Capacity Full cfs	
Unable to compute this instance.							
1.50	0.0100	0.022	3.00	0.74	3.48	6.21	
1.00	0.0200	0.022	3.00	0.83	4.32	2.98	* C1 & C4
1.50	0.0200	0.022	3.00	0.60	4.50	8.78	
1.00	0.0300	0.022	3.00	0.69	5.18	3.65	
1.50	0.0300	0.022	3.00	0.54	5.21	10.75	
1.00	0.0400	0.022	3.00	0.62	5.82	4.21	
1.50	0.0400	0.022	3.00	0.50	5.78	12.41	
1.00	0.0500	0.022	3.00	0.58	6.35	4.71	
1.50	0.0500	0.022	3.00	0.47	6.27	13.88	
1.00	0.0600	0.022	3.00	0.55	6.81	5.16	
1.50	0.0600	0.022	3.00	0.45	6.69	15.20	
1.00	0.0700	0.022	3.00	0.52	7.22	5.57	
1.50	0.0700	0.022	3.00	0.43	7.07	16.42	
1.00	0.0800	0.022	3.00	0.50	7.60	5.95	
1.50	0.0800	0.022	3.00	0.42	7.42	17.56	
1.00	0.0900	0.022	3.00	0.49	7.94	6.32	
1.50	0.0900	0.022	3.00	0.41	7.74	18.62	
1.00	0.1000	0.022	3.00	0.47	8.26	6.66	
1.50	0.1000	0.022	3.00	0.40	8.03	19.63	
1.00	0.1100	0.022	3.00	0.46	8.55	6.98	
1.50	0.1100	0.022	3.00	0.39	8.31	20.59	
Unable to compute this instance.							
1.50	0.0100	0.022	3.50	0.81	3.62	6.21	
Unable to compute this instance.							
1.50	0.0200	0.022	3.50	0.66	4.69	8.78	
1.00	0.0300	0.022	3.50	0.79	5.29	3.65	
1.50	0.0300	0.022	3.50	0.59	5.44	10.75	
1.00	0.0400	0.022	3.50	0.70	6.00	4.21	
1.50	0.0400	0.022	3.50	0.54	6.04	12.41	
1.00	0.0500	0.022	3.50	0.64	6.57	4.71	
1.50	0.0500	0.022	3.50	0.51	6.54	13.88	
1.00	0.0600	0.022	3.50	0.60	7.06	5.16	
1.50	0.0600	0.022	3.50	0.49	6.99	15.20	
1.00	0.0700	0.022	3.50	0.57	7.49	5.57	
1.50	0.0700	0.022	3.50	0.47	7.39	16.42	
1.00	0.0800	0.022	3.50	0.55	7.89	5.95	
1.50	0.0800	0.022	3.50	0.45	7.75	17.56	
1.00	0.0900	0.022	3.50	0.53	8.25	6.32	
1.50	0.0900	0.022	3.50	0.44	8.08	18.62	

VARIABLE Diameter ft	VARIABLE Channel Slope ft/ft	Mannings 'n'	VARIABLE Discharge cfs	COMPUTED Depth ft	COMPUTED Velocity fps	COMPUTED Capacity Full cfs
1.00	0.1000	0.022	3.50	0.52	8.58	6.66
1.50	0.1000	0.022	3.50	0.43	8.39	19.63
1.00	0.1100	0.022	3.50	0.50	8.90	6.98
1.50	0.1100	0.022	3.50	0.42	8.69	20.59
Unable to compute this instance.						
1.50	0.0100	0.022	4.00	0.88	3.73	6.21
Unable to compute this instance.						
1.50	0.0200	0.022	4.00	0.71	4.85	8.78
Unable to compute this instance.						
1.50	0.0300	0.022	4.00	0.63	5.64	10.75
1.00	0.0400	0.022	4.00	0.78	6.10	4.21
1.50	0.0400	0.022	4.00	0.59	6.26	12.41
1.00	0.0500	0.022	4.00	0.71	6.73	4.71
1.50	0.0500	0.022	4.00	0.55	6.79	13.88
1.00	0.0600	0.022	4.00	0.66	7.25	5.16
1.50	0.0600	0.022	4.00	0.53	7.25	15.20
1.00	0.0700	0.022	4.00	0.63	7.71	5.57
1.50	0.0700	0.022	4.00	0.50	7.67	16.42
1.00	0.0800	0.022	4.00	0.60	8.13	5.95
1.50	0.0800	0.022	4.00	0.49	8.05	17.56
1.00	0.0900	0.022	4.00	0.58	8.51	6.32
1.50	0.0900	0.022	4.00	0.47	8.40	18.62
1.00	0.1000	0.022	4.00	0.56	8.86	6.66
1.50	0.1000	0.022	4.00	0.46	8.72	19.63
1.00	0.1100	0.022	4.00	0.54	9.19	6.98
1.50	0.1100	0.022	4.00	0.45	9.02	20.59
Unable to compute this instance.						
1.50	0.0100	0.022	4.50	0.95	3.83	6.21
Unable to compute this instance.						
1.50	0.0200	0.022	4.50	0.76	5.00	8.78
Unable to compute this instance.						
1.50	0.0300	0.022	4.50	0.68	5.81	10.75
1.00	0.0400	0.022	4.50	0.91	6.01	4.21
1.50	0.0400	0.022	4.50	0.62	6.46	12.41
1.00	0.0500	0.022	4.50	0.78	6.82	4.71
1.50	0.0500	0.022	4.50	0.59	7.01	13.88
1.00	0.0600	0.022	4.50	0.72	7.40	5.16
1.50	0.0600	0.022	4.50	0.56	7.49	15.20
1.00	0.0700	0.022	4.50	0.68	7.89	5.57
1.50	0.0700	0.022	4.50	0.54	7.92	16.42

VARIABLE Diameter ft	VARIABLE Channel Slope ft/ft	Mannings 'n'	VARIABLE Discharge cfs	COMPUTED Depth ft	COMPUTED Velocity fps	COMPUTED Capacity Full cfs	
1.00	0.0800	0.022	4.50	0.65	8.33	5.95	
1.50	0.0800	0.022	4.50	0.52	8.32	17.56	
1.00	0.0900	0.022	4.50	0.62	8.73	6.32	
1.50	0.0900	0.022	4.50	0.50	8.68	18.62	
1.00	0.1000	0.022	4.50	0.60	9.10	6.66	
1.50	0.1000	0.022	4.50	0.49	9.01	19.63	
1.00	0.1100	0.022	4.50	0.58	9.45	6.98	
1.50	0.1100	0.022	4.50	0.48	9.33	20.59	
Unable to compute this instance.							
1.50	0.0100	0.022	5.00	1.02	3.91	6.21	
Unable to compute this instance.							
1.50	0.0200	0.022	5.00	0.81	5.13	8.78	
Unable to compute this instance.							
1.50	0.0300	0.022	5.00	0.72	5.97	10.75	
Unable to compute this instance.							
1.50	0.0400	0.022	5.00	0.66	6.65	12.41	
1.00	0.0500	0.022	5.00	0.89	6.75	4.71	
1.50	0.0500	0.022	5.00	0.62	7.21	13.88	
1.00	0.0600	0.022	5.00	0.79	7.48	5.16	
1.50	0.0600	0.022	5.00	0.59	7.71	15.20	
1.00	0.0700	0.022	5.00	0.74	8.02	5.57	
1.50	0.0700	0.022	5.00	0.57	8.16	16.42	
1.00	0.0800	0.022	5.00	0.70	8.49	5.95	
1.50	0.0800	0.022	5.00	0.55	8.56	17.56	
1.00	0.0900	0.022	5.00	0.67	8.92	6.32	
1.50	0.0900	0.022	5.00	0.53	8.93	18.62	
1.00	0.1000	0.022	5.00	0.65	9.31	6.66	
1.50	0.1000	0.022	5.00	0.52	9.28	19.63	
1.00	0.1100	0.022	5.00	0.63	9.67	6.98	
1.50	0.1100	0.022	5.00	0.50	9.61	20.59	
Unable to compute this instance.							
1.50	0.0100	0.022	5.50	1.10	3.97	6.21	
Unable to compute this instance.							
1.50	0.0200	0.022	5.50	0.86	5.24	8.78	C6
Unable to compute this instance.							
1.50	0.0300	0.022	5.50	0.76	6.12	10.75	
Unable to compute this instance.							
1.50	0.0400	0.022	5.50	0.70	6.81	12.41	
Unable to compute this instance.							
1.50	0.0500	0.022	5.50	0.66	7.40	13.88	C2

VARIABLE Diameter ft	VARIABLE Channel Slope ft/ft	Mannings 'n'	VARIABLE Discharge cfs	COMPUTED Depth ft	COMPUTED Velocity fps	COMPUTED Capacity Full cfs
1.00	0.0600	0.022	5.50	0.90	7.38	5.16
1.50	0.0600	0.022	5.50	0.62	7.91	15.20
1.00	0.0700	0.022	5.50	0.81	8.08	5.57
1.50	0.0700	0.022	5.50	0.60	8.37	16.42
1.00	0.0800	0.022	5.50	0.76	8.61	5.95
1.50	0.0800	0.022	5.50	0.58	8.79	17.56
1.00	0.0900	0.022	5.50	0.72	9.06	6.32
1.50	0.0900	0.022	5.50	0.56	9.17	18.62
1.00	0.1000	0.022	5.50	0.69	9.47	6.66
1.50	0.1000	0.022	5.50	0.54	9.53	19.63
1.00	0.1100	0.022	5.50	0.67	9.85	6.98
1.50	0.1100	0.022	5.50	0.53	9.86	20.59
Unable to compute this instance.						
1.50	0.0100	0.022	6.00	1.19	4.00	6.21
Unable to compute this instance.						
1.50	0.0200	0.022	6.00	0.91	5.35	8.78
Unable to compute this instance.						
1.50	0.0300	0.022	6.00	0.80	6.25	10.75
Unable to compute this instance.						
1.50	0.0400	0.022	6.00	0.74	6.97	12.41
Unable to compute this instance.						
1.50	0.0500	0.022	6.00	0.69	7.57	13.88
Unable to compute this instance.						
1.50	0.0600	0.022	6.00	0.65	8.10	15.20
Unable to compute this instance.						
1.50	0.0700	0.022	6.00	0.63	8.57	16.42
1.00	0.0800	0.022	6.00	0.83	8.64	5.95
1.50	0.0800	0.022	6.00	0.60	9.00	17.56
1.00	0.0900	0.022	6.00	0.78	9.15	6.32
1.50	0.0900	0.022	6.00	0.59	9.39	18.62
1.00	0.1000	0.022	6.00	0.74	9.59	6.66
1.50	0.1000	0.022	6.00	0.57	9.76	19.63
1.00	0.1100	0.022	6.00	0.71	10.00	6.98
1.50	0.1100	0.022	6.00	0.55	10.10	20.59
Unable to compute this instance.						
1.50	0.0100	0.022	6.50	1.31	3.98	6.21
Unable to compute this instance.						
1.50	0.0200	0.022	6.50	0.96	5.44	8.78
Unable to compute this instance.						
1.50	0.0300	0.022	6.50	0.84	6.37	10.75

VARIABLE Diameter ft	VARIABLE Channel Slope ft/ft	Mannings 'n'	VARIABLE Discharge cfs	COMPUTED Depth ft	COMPUTED Velocity fps	COMPUTED Capacity Full cfs
Unable to compute this instance.						
1.50	0.0400	0.022	6.50	0.77	7.11	12.41
Unable to compute this instance.						
1.50	0.0500	0.022	6.50	0.72	7.73	13.88
Unable to compute this instance.						
1.50	0.0600	0.022	6.50	0.69	8.27	15.20
Unable to compute this instance.						
1.50	0.0700	0.022	6.50	0.66	8.75	16.42
Unable to compute this instance.						
1.50	0.0800	0.022	6.50	0.63	9.19	17.56
1.00	0.0900	0.022	6.50	0.85	9.15	6.32
1.50	0.0900	0.022	6.50	0.61	9.60	18.62
1.00	0.1000	0.022	6.50	0.80	9.66	6.66
1.50	0.1000	0.022	6.50	0.59	9.97	19.63
1.00	0.1100	0.022	6.50	0.76	10.10	6.98
1.50	0.1100	0.022	6.50	0.58	10.33	20.59
Unable to compute this instance.						
Unable to compute this instance.						
Unable to compute this instance.						
1.50	0.0200	0.022	7.00	1.01	5.52	8.78
Unable to compute this instance.						
1.50	0.0300	0.022	7.00	0.88	6.48	10.75
Unable to compute this instance.						
1.50	0.0400	0.022	7.00	0.81	7.24	12.41
Unable to compute this instance.						
1.50	0.0500	0.022	7.00	0.75	7.87	13.88
Unable to compute this instance.						
1.50	0.0600	0.022	7.00	0.71	8.43	15.20
Unable to compute this instance.						
1.50	0.0700	0.022	7.00	0.68	8.92	16.42
Unable to compute this instance.						
1.50	0.0800	0.022	7.00	0.66	9.37	17.56
Unable to compute this instance.						
1.50	0.0900	0.022	7.00	0.64	9.79	18.62
1.00	0.1000	0.022	7.00	0.88	9.60	6.66
1.50	0.1000	0.022	7.00	0.62	10.17	19.63
1.00	0.1100	0.022	7.00	0.82	10.13	6.98
1.50	0.1100	0.022	7.00	0.60	10.54	20.59



PACOLET MILLS QUAD.

FIGURE 1-1

RMT, INC. 938.04 0292

SITE LOCATION MAP

SCALE: 1"=2000'

MEDLEY FARMS
GAFFNEY, SC.

SCS Hydrograph Generation Program

MEDLEY FARM - UNNAMED TRIBUTARY (10 YEAR/24 HOUR)

DRAINAGE AREA = .0546875 SQUARE MILES
TIME OF CONCENTRATION = .4648457 HOURS
RUNOFF CURVE NUMBER = 77
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 5.1 INCHES
RUNOFF = 2.71 INCHES = 7.89 ACRE FEET
VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 83.22 CFS AT 12.1 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
25.30	5.10	2.71	0.00

SCS Hydrograph Generation Program

MEDLEY FARM - UNNAMED TRIBUTARY (25 YEAR/24 HOUR)

DRAINAGE AREA = .0546875 SQUARE MILES
TIME OF CONCENTRATION = .4648457 HOURS
RUNOFF CURVE NUMBER = 77
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 5.9 INCHES
RUNOFF = 3.39 INCHES = 9.89 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 104.83 CFS AT 12.1 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
25.30	5.90	3.39	0.00

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Description:

Solve For Actual Depth

Given Constant Data;

Diameter..... 4.00
Mannings n..... 0.022

Variable Input Data	Minimum	Maximum	Increment By
Slope	0.0400	0.1100	0.0100
Discharge	85.00	105.00	10.00

Diameter ft	VARIABLE Channel Slope ft/ft	Mannings 'n'	VARIABLE Discharge cfs	COMPUTED Depth ft	COMPUTED Velocity fps	COMPUTED Capacity Full cfs	
4.00	0.0400	0.022	85.00	2.00	13.51	169.76	
4.00	0.0500	0.022	85.00	1.88	14.69	189.80	
4.00	0.0600	0.022	85.00	1.78	15.71	207.91	C5
4.00	0.0700	0.022	85.00	1.71	16.63	224.57	
4.00	0.0800	0.022	85.00	1.64	17.47	240.08	
4.00	0.0900	0.022	85.00	1.59	18.23	254.64	
4.00	0.1000	0.022	85.00	1.55	18.95	268.41	C3
4.00	0.1100	0.022	85.00	1.51	19.62	281.52	
4.00	0.1200	0.022	85.00	1.47	20.25	294.03	
4.00	0.0400	0.022	95.00	2.14	13.89	169.76	
4.00	0.0500	0.022	95.00	2.00	15.11	189.80	
4.00	0.0600	0.022	95.00	1.90	16.17	207.91	
4.00	0.0700	0.022	95.00	1.82	17.12	224.57	
4.00	0.0800	0.022	95.00	1.75	17.99	240.08	
4.00	0.0900	0.022	95.00	1.69	18.79	254.64	
4.00	0.1000	0.022	95.00	1.64	19.53	268.41	
4.00	0.1100	0.022	95.00	1.60	20.22	281.52	
4.00	0.1200	0.022	95.00	1.56	20.87	294.03	
4.00	0.0400	0.022	105.00	2.28	14.22	169.76	
4.00	0.0500	0.022	105.00	2.12	15.48	189.80	
4.00	0.0600	0.022	105.00	2.01	16.59	207.91	
4.00	0.0700	0.022	105.00	1.92	17.57	224.57	
4.00	0.0800	0.022	105.00	1.85	18.47	240.08	
4.00	0.0900	0.022	105.00	1.79	19.29	254.64	
4.00	0.1000	0.022	105.00	1.74	20.05	268.41	
4.00	0.1100	0.022	105.00	1.69	20.77	281.52	
4.00	0.1200	0.022	105.00	1.65	21.44	294.03	

RMT INC.

DESIGN SHEET

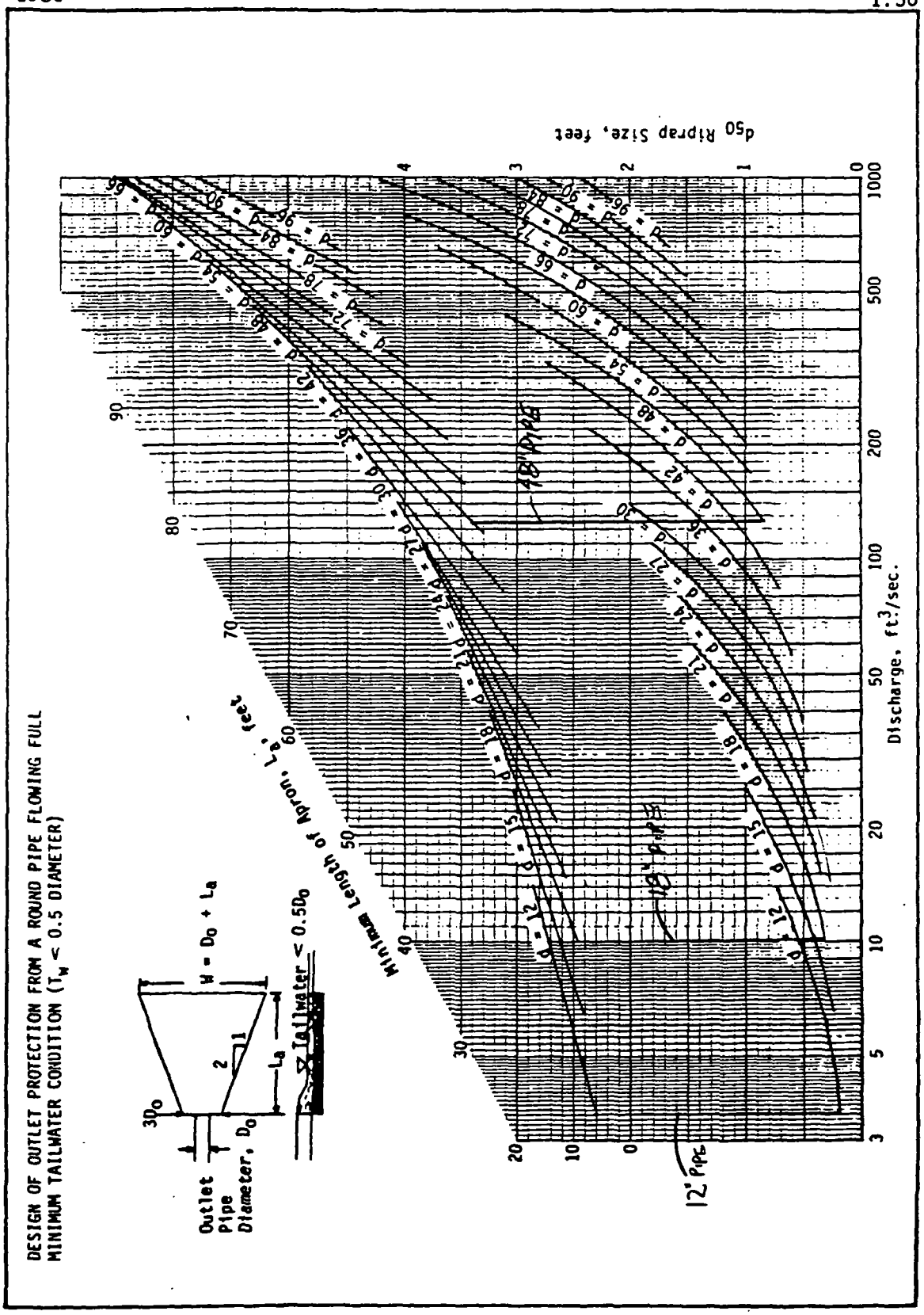
100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
MEDLEY FARM	JWM	5/25/07			938.11

Outlet Protection

Culvert #	Q_{10} (cfs)	V_{10} (fps)	D_o (in)	L (ft)	W (ft)	d_{50} (in.)	d (in)
C1	3	4.3	12	6	7	4	6
C2	5.5	7.4	18	10	11.5	4	6
C3	85	18.9	48	28	32	10	1'-3"
C4	3	4.3	12	6	7	4	6"
C5	85	15.7	48	28	32	10	1'-3"
C6	5.5	5.2	18	10	11.5	4	6"

SEE ATTACHED CHART – USE MIN. INDICATED FOR EACH PIPE ON CHART



Source: USDA-SCS

Plate 1.36c

APPENDIX H
PROCESS CONTROL NARRATIVE

MEDLEY FARMS
GROUND WATER RECOVERY

CONTROLS NARRATIVE

MAY 25, 1993

I. RECOVERY WELLS

There are seven Recovery Wells serving System A and four serving System B.

Located at each well is an inlet and an outlet flow indicating transmitter and an inlet pressure indicator.

Each well has a one minute rolling average flow recorded within the PLC (Programmable Logic Controller) for the most recent 60 minutes. These recorded values are accessible via modem by the GWS (Graphics Work Station) located at RMT-GVL.

II. RECIRCULATION TANK T-1

The Recirculation Tank has level transmitter LIT-100 with its input into the PLC. Level switches LSL-100, LSH-100 and LSHH-100 are located within the PLC.

The PLC issues alarm's LAL-100A and LAHH-100A which are located on CP1 (Ground Water Recovery Control Panel).

Alarms LAL-100B and LAHH-100B are accessible via the modem by the GWS.

When low level in Tank T-1 is reached, LSL-100 will shut down Pumps P-100 and P-200.

If high-high level in Tank T-1 is reached, LSHH-100 will shut down Pumps P-100 and P-200.

When high level in Tank T-1 is reached and the Air Stripper Blower's HS-400 is in the auto position, LSH-100 will start Pumps P-100 or P-200 if HS-100 or HS-200, respectively, is in the auto position.

P-100 or P-200 runs anytime HS-100 or HS-200, respectively, is in the Hand position and LSL-100 senses that there is sufficient liquid level in Tank T-1.

Motor alarm MA-100A is located on CP1 and indicates that P-100 of System A is running.

Motor alarm MA-100B is accessible via the modem by the GWS and indicates that P-100 is running.

Motor alarm MA-200A is located on CP1 and indicates that P-200 of System B is running.

Motor alarm MA-200B is accessible via the modem by the GWS and indicates that P-200 is running.

Pressure indicators PI-100 and PI-200 indicate the respective outlet pressure of P-100 and P-200.

In the auto position of HS-100, HS-200 and HS-400 if FSL-400 is not sensing air flow into the Air Stripper within 10 minutes after B-400 is requiested to start, B-400 will shutdown.

III. AIR STRIPPER AS-1

Failed closed flow valves FV-200A, FV-200B and FV-200C are energized to allow flow from Tank T-1 into the Air Stripper when the Air Stripper Blower B-400 is running.

If HS-400 is in the auto position and high liquid level is reached in the Air Stripper, LAH-400 indicates and alarm on CP1 and shutsdown B-400.

Alarm LAH-400B is accessible via the modem by the GWS and indicates high liquid level within the Air Stripper.

Air Stripper Blower B-400 is manually started via HS-400 and motor alarm MA-400A on CP1 indicates that B-400 is running.

Motor alarm MA-400B is accessible via the modem by the GWS and indicates that B-400 is running.

Flow switch FSL-400 senses the air flow into AS-1 and flow alarm FAL-400A on CP1 indicates a loss of air flow.

Alarm FAL-400B is accessible via the modem by the GWS and indicates a loss of air flow.

FSL-400 confirms that B-400 is running after 10 seconds of B-400 being told to start.

LSH-400, FSL-400 and PI-400 are furnished with the Air Stripper.

IV. Outflow

Outflow of liquid will be measured with a Parshall Flume.

Flow indicating/totalizing transmitter FIT-500/FQ-500 sends its signals to the PLC.

Totalized flow FQI-500A is indicated on CP1 and is accessible as FQI-500B via the modem by the GWS.

Instantaneous flow FI-500A is indicated on CP1 and is accessible as FI-500B via the modem by the GWS.

High flow alarm FAH-500 is indicated on CP1 and is accessible as FAH-500 via the modem by the GWS.

FSL-500 indicates low flow to the diffuser.

Alarm FAH-500A will indicate on CP1 when there is low flow to the diffuser while B-400 is running.

Alarm FAH-500B is accessible via the modem by the GWS.

V. EMERGENCY MODEM CALL BACK

An emergency call will automatically be placed from the site to the RMT-GVL office if the following alarms occur:

When FAL-400A alarms.
Only one Pump of P-100 or P-200 is running.
FAL-500A alarms.

APPENDIX I

INSTRUMENTATION LISTING

	CLIENT:MEDLEY FARMS - GAFFNEY	INSTRUMENT INDEX		
RMT, INC.	TITLE :GROUND WATER RECOVERY &		REVISION: 03-09-93	DATE PRINTED
Greenville,	:SOIL VAPOR RECOVERY		BY: REL	09-Mar-93
SC	P/N :938.11		FILENAME: g:\data\elect\0093811\02D55ILA.WK1	07:07 AM

Instrument Number	QTY.	DESCRIPTION AND SERVICE	PLC MOD P/F	INSTR. SPEC. SHEET	P.O. or REQ. NUMBER	DRAWING REFERENCE LOCATION	DRAWING REFERENCE P&ID	AI	AO	DI	DO	REMARKS
		GROUND WATER RECOVERY										
FIT 101A		FLOW TO WELL A1	F	FIT-101A		938-I01	938-C04	1				
FIT 101B		FLOW FROM WELL A1	F	FIT-101B		938-I01	938-C04	1				
FIT 102A		FLOW TO WELL A2	F	FIT-101A		938-I01	938-C04	1				
FIT 102B		FLOW FROM WELL A2	F	FIT-101B		938-I01	938-C04	1				
FIT 103A		FLOW TO WELL A3	F	FIT-101A		938-I01	938-C04	1				
FIT 103B		FLOW FROM WELL A3	F	FIT-101B		938-I01	938-C04	1				
FIT 104A		FLOW TO WELL A4	F	FIT-101A		938-I01	938-C04	1				
FIT 104B		FLOW FROM WELL A4	F	FIT-101B		938-I01	938-C04	1				
FIT 105A		FLOW TO WELL A5	F	FIT-101A		938-I01	938-C04	1				
FIT 105B		FLOW FROM WELL A5	F	FIT-101B		938-I01	938-C04	1				
FIT 106A		FLOW TO WELL A6	F	FIT-101A		938-I01	938-C04	1				
FIT 106B		FLOW FROM WELL A6	F	FIT-101B		938-I01	938-C04	1				
FIT 107A		FLOW TO WELL A7	F	FIT-101A		938-I01	938-C04	1				
FIT 107B		FLOW FROM WELL A7	F	FIT-101B		938-I01	938-C04	1				
FIT 201A		FLOW TO WELL B1	F	FIT-101A		938-I01	938-C04	1				
FIT 201B		FLOW FROM WELL B1	F	FIT-101B		938-I01	938-C04	1				
FIT 202A		FLOW TO WELL B2	F	FIT-101A		938-I01	938-C04	1				
FIT 202B		FLOW FROM WELL B2	F	FIT-101B		938-I01	938-C04	1				
FIT 203A		FLOW TO WELL B3	F	FIT-101A		938-I01	938-C04	1				
FIT 203B		FLOW FROM WELL B3	F	FIT-101B		938-I01	938-C04	1				
FIT 204A		FLOW TO WELL B3	F	FIT-101A		938-I01	938-C04	1				
FIT 204B		FLOW FROM WELL B3	F	FIT-101B		938-I01	938-C04	1				
FR 101A		FLOW RECORDER TO WELL A1	MOD			938-I01	938-C04					
FR 101B		FLOW RECORDER FROM WELL A1	MOD			938-I01	938-C04					
FR 102A		FLOW RECORDER TO WELL A2	MOD			938-I01	938-C04					
FR 102B		FLOW RECORDER FROM WELL A2	MOD			938-I01	938-C04					

	CLIENT:MEDLEY FARMS - GAFFNEY	INSTRUMENT INDEX		
RMT, INC.	TITLE :GROUND WATER RECOVERY &	REVISION: 03-09-93		DATE PRINTED
Greenville,	:SOIL VAPOR RECOVERY	BY: REL		09-Mar-93
SC	P/N :938.11	FILENAME: g:\data\elect\0093811\02D55ILA.WK1		07:07 AM

Instrument Number	QTY.	DESCRIPTION AND SERVICE	PLC MOD P/F	INSTR. SPEC. SHEET	P.O. or REQ. NUMBER	DRAWING REFERENCE LOCATION	P&ID	AI	AO	DI	DO	REMARKS
FR 103A		FLOW RECORDER TO WELL A3	MOD			938-I01	938-C04					
FR 103B		FLOW RECORDER FROM WELL A3	MOD			938-I01	938-C04					
FR 104A		FLOW RECORDER TO WELL A4	MOD			938-I01	938-C04					
FR 104B		FLOW RECORDER FROM WELL A4	MOD			938-I01	938-C04					
FR 105A		FLOW RECORDER TO WELL A5	MOD			938-I01	938-C04					
FR 105B		FLOW RECORDER FROM WELL A5	MOD			938-I01	938-C04					
FR 106A		FLOW RECORDER TO WELL A6	MOD			938-I01	938-C04					
FR 106B		FLOW RECORDER FROM WELL A6	MOD			938-I01	938-C04					
FR 107A		FLOW RECORDER TO WELL A7	MOD			938-I01	938-C04					
FR 107B		FLOW RECORDER FROM WELL A7	MOD			938-I01	938-C04					
FR 201A		FLOW RECORDER TO WELL B1	MOD			938-I01	938-C04					
FR 201B		FLOW RECORDER FROM WELL B1	MOD			938-I01	938-C04					
FR 202A		FLOW RECORDER TO WELL B2	MOD			938-I01	938-C04					
FR 202B		FLOW RECORDER FROM WELL B2	MOD			938-I01	938-C04					
FR 203A		FLOW RECORDER TO WELL B3	MOD			938-I01	938-C04					
FR 203B		FLOW RECORDER FROM WELL B3	MOD			938-I01	938-C04					
FR 204A		FLOW RECORDER TO WELL B4	MOD			938-I01	938-C04					
FR 204B		FLOW RECORDER FROM WELL B4	MOD			938-I01	938-C04					
PI 101		PRESSURE INTO WELL A1	F	PI-100		938-I01	938-C04					
PI 102		PRESSURE INTO WELL A2	F	PI-100		938-I01	938-C04					
PI 103		PRESSURE INTO WELL A3	F	PI-100		938-I01	938-C04					
PI 104		PRESSURE INTO WELL A4	F	PI-100		938-I01	938-C04					
PI 105		PRESSURE INTO WELL A5	F	PI-100		938-I01	938-C04					
PI 106		PRESSURE INTO WELL A6	F	PI-100		938-I01	938-C04					
PI 107		PRESSURE INTO WELL A7	F	PI-100		938-I01	938-C04					
PI 108		TURNAROUND MANHOLE SYSTEM A	F	PI-100		938-I01	938-C04					
PI 201		PRESSURE INTO WELL B1	F	PI-100		938-I01	938-C04					
PI 202		PRESSURE INTO WELL B2	F	PI-100		938-I01	938-C04					
PI 203		PRESSURE INTO WELL B3	F	PI-100		938-I01	938-C04					

	CLIENT:MEDLEY FARMS - GAFFNEY	INSTRUMENT INDEX		
RMT, INC.	TITLE :GROUND WATER RECOVERY &	REVISION: 03-09-93		DATE PRINTED
Greenville,	:SOIL VAPOR RECOVERY	BY: REL		09-Mar-93
SC	P/N :938.11	FILENAME: g:\data\elect\0093811\02D55ILA.WK1		07:07 AM

Instrument Number	QTY.	DESCRIPTION AND SERVICE	PLC MOD P/F	INSTR. SPEC. SHEET	P.O. or REQ. NUMBER	DRAWING REFERENCE LOCATION	DRAWING REFERENCE P&ID	AI	AO	DI	DO	REMARKS
PI 204		PRESSURE INTO WELL B4	F	PI-100		938-I01	938-C04					
PI 205		TURNAROUND MANHOLE SYSTEM B	F	PI-100		938-I01	938-C04					
LT 100		LEVEL IN T1	F	LIT-100		938-I01	938-C04	1				
LSL 100		LOW LEVEL SWITCH FOR T1	PLC			938-I01	938-C04					
LSLL 100		LOW LOW LEVEL SWITCH FOR T1	PLC			938-I01	938-C04					
LSH 100		HIGH LEVEL SWITCH FOR T1	PLC			938-I01	938-C04					
LSHH 100		HIGH-HIGH LEVEL SWITCH FOR T1	PLC			938-I01	938-C04					
LAL 100A		LOW LEVEL ALARM IN T1	P			938-I01	938-C04				1	
LAL 100B		LOW LEVEL ALARM IN T1	MOD			938-I01	938-C04					
LAHH 100A		HIGH-HIGH LEVEL ALARM IN T1	P			938-I01	938-C04				1	
LAHH 100B		HIGH-HIGH LEVEL ALARM IN T1	MOD			938-I01	938-C04					
HS 100		H-O-A OF P100	P			938-I01	938-C04			3		
MA 100A		MOTOR RUN ALARM P100	P			938-I01	938-C04				1	
MA 100B		MOTOR RUN ALARM P100	MOD			938-I01	938-C04					
PI 100		PRESSURE OUT OF P100	F	PI-100		938-I01	938-C04					
HS 200		H-O-A OF P200	P			938-I01	938-C04			3		
MA 200A		MOTOR RUN ALARM P200	P			938-I01	938-C04				1	
MA 200B		MOTOR RUN ALARM P200	MOD			938-I01	938-C04					
PI 200		PRESSURE OUT OF P200	F	PI-100		938-I01	938-C04					
FV 200A		FLOW VALVE INTO AIR STRIPPER	F	FV-200A		938-I01	938-C04				1	
FV 200B		FLOW VALVE INTO AIR STRIPPER	F	FV-200A		938-I01	938-C04				1	
FV 200B		FLOW VALVE INTO AIR STRIPPER	F	FV-200A		938-I01	938-C04				1	
LSH 400		HIGH LEVEL SWITCH IN AIR STRIPPER	FWE			938-I01	938-C04			1		
LAH 400A		HIGH LEVEL ALARM IN AIR STRIPPER	P			938-I01	938-C04				1	
LAH 400B		HIGH LEVEL ALARM IN AIR STRIPPER	MOD			938-I01	938-C04					
PI 400		PRESSURE IN AIR STRIPPER	FWE			938-I01	938-C04					
FSL 400		LOW AIR FLOW SWITCH FROM BLOWER	FWE			938-I01	938-C04			1		
FAL 400A		LOW AIR FLOW ALARM FROM BLOWER	P			938-I01	938-C04				1	
FAL 400B		LOW AIR FLOW ALARM FROM BLOWER	MOD			938-I01	938-C04					

	CLIENT:MEDLEY FARMS - GAFFNEY	INSTRUMENT INDEX		
RMT, INC.	TITLE :GROUND WATER RECOVERY &	REVISION: 03-09-93		DATE PRINTED
Greenville,	:SOIL VAPOR RECOVERY	BY: REL		09-Mar-93
SC	P/N :938.11	FILENAME: g:\data\elect\0093811\02D55ILA.WK1		07:07 AM

Instrument Number	QTY.	DESCRIPTION AND SERVICE	PLC MOD P/F	INSTR. SPEC. SHEET	P.O. or REQ. NUMBER	DRAWING REFERENCE LOCATION	DRAWING REFERENCE P&ID	AI	AO	DI	DO	REMARKS
HS 400		H-O-A FOR BLOWER	P			938-101	938-C04			3		
MA 400A		MOTOR RUN ALARM B500	P			938-101	938-C04				1	
MA 400B		MOTOR RUN ALARM B500	MOD			938-101	938-C04					
FIT/FQ 500		FLOW INDICATING & TOTAL TO DIFFUSER	F	FIT-500		938-101	938-C04	1		1		
FI 500A		FLOW INDICATION TO DIFFUSER	P			938-101	938-C04					
FI 500B		FLOW INDICATION TO DIFFUSER	MOD			938-101	938-C04					
FQI 500A		FLOW TOTAL INDICATION TO DIFFUSER	P			938-101	938-C04					
FQI 500B		FLOW TOTAL INDICATION TO DIFFUSER	MOD			938-101	938-C04					
FSL 500		LOW FLOW TO DIFFUSER	PLC			938-101	938-C04					
FSH 500		HIGH FLOW TO DIFFUSER	PLC			938-101	938-C04					
FAH 500A		HIGH FLOW ALARM TO DIFFUSER	P			938-101	938-C04				1	
FAH 500B		HIGH FLOW ALARM TO DIFFUSER	MOD			938-101	938-C04					

	CLIENT:MEDLEY FARMS - GAFFNEY		INSTRUMENT INDEX											
RMT, INC.	TITLE :GROUND WATER RECOVERY &					REVISION:	03-09-93						DATE PRINTED	
Greenville,	:SOIL VAPOR RECOVERY					BY:	REL						09-Mar-93	
SC	P/N :938.11					FILENAME:	g:\data\elect\0093811\02D55ILA.WK1						07:07 AM	
Instrument Number	QTY.	DESCRIPTION AND SERVICE	PLC MOD P/F	INSTR. SPEC. SHEET	P.O. or REQ. NUMBER	DRAWING REFERENCE LOCATION	DRAWING REFERENCE P&ID	AI	AO	DI	DO	REMARKS		
		SOIL VAPOR RECOVERY												
LSL 1100		LOW LEVEL SWITCH IN CONDENSATE TRAP	FWE			938-I01	938-C04							
PI 1201		PRESSURE OUT OF FILTER	FWE			938-I01	938-C04							
FT 1201		FLOW OUT OF FILTER	FWE			938-I01	938-C04							
PI 1202		PRESSURE OUT OF AIR INTAKE	FWE			938-I01	938-C04							
FT 1202		FLOW OUT OF AIR INTAKE	FWE			938-I01	938-C04							
VRV 1300		VACUUM RELIEF VALVE INTO VACUUM PUMP	FWE			938-I01	938-C04							
HS 1300		H-O-A FOR VACUUM PUMP	FWE			938-I01	938-C04							
MA 1300		MOTOR RUN ALARM FOR VACUUM PUMP	FWE			938-I01	938-C04							
TSH 1300		AIR TEMP HIGH OUT OF VACUUM PUMP	FWE			938-I01	938-C04							
TI 1300		TEMP INDICATION OUT OF VACUUM PUMP	FWE			938-I01	938-C04							
PI 1300		PRESS INDICATION OUT OF VACUUM PUMP	FWE			938-I01	938-C04							